

# BULLETIN OF MISCELLANEOUS INFORMATION No. 1 1934 ROYAL BOTANIC GARDENS, KEW

## I—SOME INDIAN RHODOPHYCEAE ESPECIALLY FROM THE SHORES OF THE PRESIDENCY OF BOMBAY: IV.\* F. BOERGESEN.

In this, the concluding part of this series, the majority of the algae referred to are represented by material in the Kew Herbarium. By far the greater number of the species belong to the northern part of the Arabian Sea and more especially to the environs of Karachi, a locality which contains a most interesting algal flora showing remarkable affinities with those of areas as distant as the Cape, Australia and Japan south- and eastwards, and with those of the Red Sea, the Mediterranean Sea and even the Atlantic Ocean westwards.

The principal and most valuable collection examined was collected by the late James A. Murray, who was (according to information supplied by Mr. A. D. Cotton) Curator of the Kurrachee Municipal Museum and the author of the following books: "A Handbook to the Geology, Botany and Zoology of Sind" (1880); "Kurrachee to Kandahar"; and "The Plants and Drugs of Sind" (London 1881). His collections were made during the years 1881-3 and contain a large number of well prepared specimens.

I have further been able to examine a big album in folio presented to Kew by Miss L. Frere. It contains a collection of nicely prepared specimens evidently gathered by a beauty-loving dilettante, many of the specimens being arranged artificially in large groups. A third collection, given to Kew by Mr. N. M. Paul, Curator of the Victoria Museum at Karachi, contained several species of much interest.

Finally a few specimens from the Kew Herbarium were gathered by Capt. W. J. S. Pullen, Karachi, 1859.

I desire to thank Sir Arthur Hill, the Director of the Royal Botanic Gardens, Kew, as well as the Keeper of the Herbarium, Mr. A. D. Cotton, for the kindness they have shown me by placing at my disposal these valuable collections by means of which our knowledge of these algologically little-known areas has been increased. I wish also to thank Dr. M. A. Howe, Assistant Director, New York Botanical Garden, who has been so kind as to send me for determination a fine and rather large collection of algae from Karachi. This collection was gathered by Mr. A. B. Kotwal, Karachi, who wrote

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\*Continued from *K.B.* 1933, 113.

that they came chiefly from Cape Monze. This gentleman moreover sent me some specimens a few years ago for determination.

I must also mention a small collection from Karachi which Mr. K. Naik, at that time staying at Sind College, Karachi, most kindly presented to me during my stay in Bombay. This was preserved in spirit and is consequently very valuable. I much regret that I had no opportunity of visiting Karachi myself. The northernmost localities I visited were Dwarka and the neighbouring Okha Port, where a rich and varied algal flora is found. Some of the species collected there are incorporated in these contributions, and at this locality too, although the algal flora is rather different from that of Karachi, several species occur which are common to some of the above-mentioned remote areas. Finally some species from my collections from Bombay and South India are included in the present list.

#### CHAETANGIACEAE.

**Gloiophloea fascicularis** Boergs., sp. nov. ; a *G. Okamurai* Setch., facie persimilis, thallo latiore, colore in sicco magis rubro, cystocarpis majoribus inter alia differt.

Frons rubro-purpurea, dichotoma, fastigiato-fascicularis, carnosocartilaginea, cylindracea, ad 17 cm. alta, circiter 2 mm. lata. Axis centralis invisibilis. Cortex circiter  $80\mu$  crassus; cortex periphericus  $50\mu$  crassus, e filamentis cellularum coloratarum brevibus dichotomis anticlinis, moniliformibus, et utriculis subellipticis majoribus compositus; cortice interno e filamentis gracilibus formato. Cystocarpia sparsa, lageniformia, circiter  $160\mu$  lata et  $225\mu$  longa (cum collo).

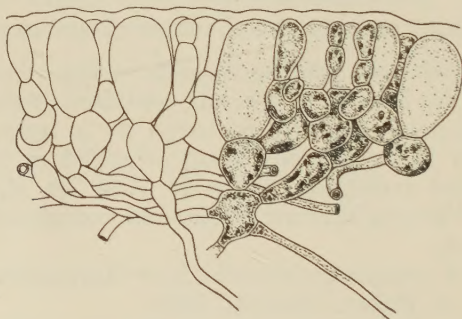


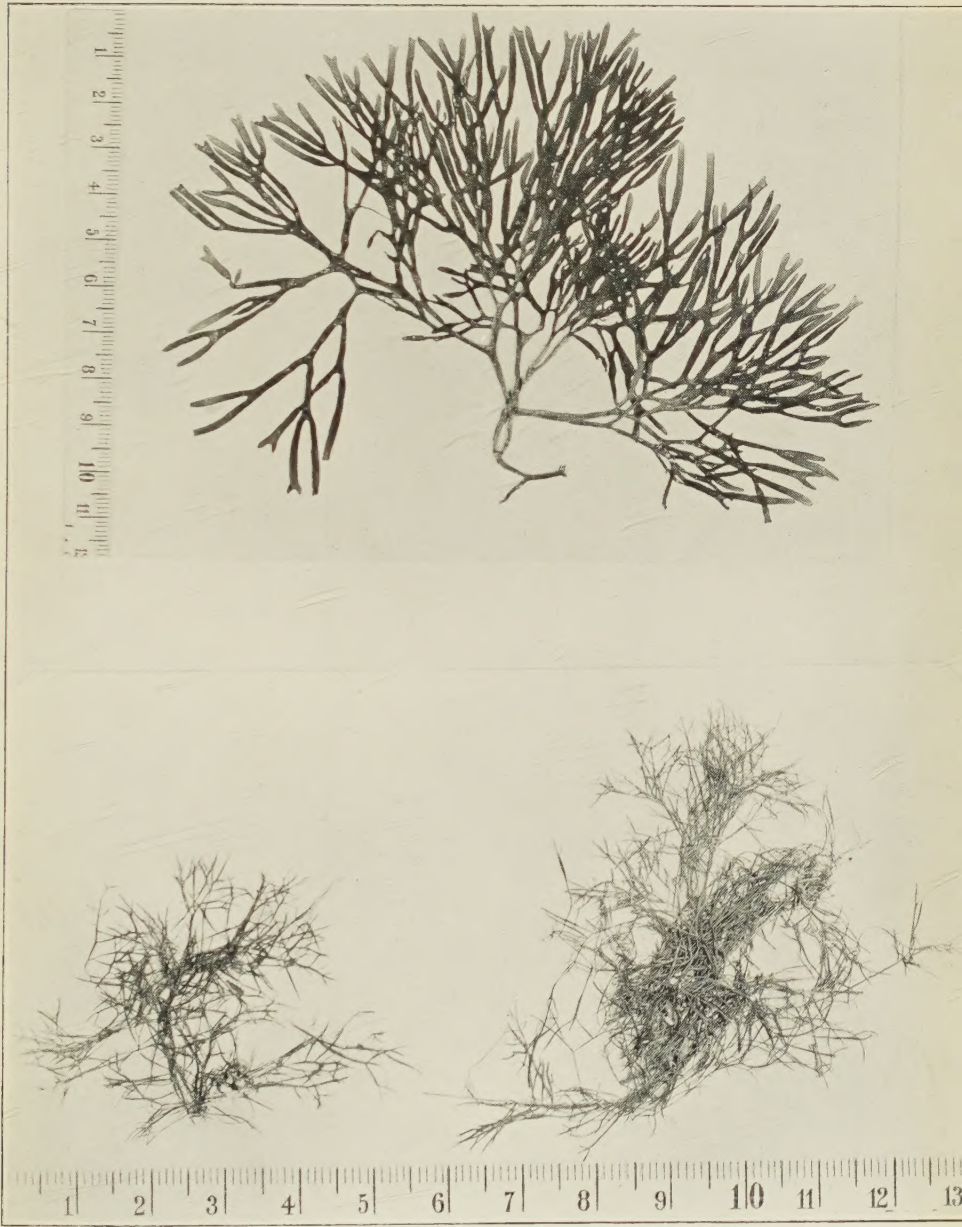
Fig. 1. *Gloiophloea fascicularis* Boergs.  
Transverse section of thallus ( $\times 600$ ).

INDIA : Okha Port, *Boergesen* 5491 (type), cast ashore ; Karachi, *J. A. Murray* (Herb. Kew., a single sterile specimen most probably belonging to this species).

The plant (Plate I) reaches a height of 14–15 cm. The cartilaginous thallus is terete, not constricted, about 2 mm. thick, keeping this size very evenly from the base to summit of the thallus ; it is repeatedly forked, the joints between each fork being about 2 cm.



PLATE I




*Gloiophloea fascicularis* Boergs. sp. nov. (above).

*Gelidium heteroplatos* Boergs. sp. nov. (below).

The scale on all plates represents centimetres.

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long, more rarely only 1 cm. or up to 3 cm. The colour of the dried plant is light red in the upper, young parts, but it becomes darker in the older portion; the living plant had a fine, rosy-red colour. The axial strand is not visible in dried specimens nor in specimens preserved in spirit. The cystocarps are irregularly scattered. The cortex is  $80\mu$  thick; the outer part is about  $50\mu$  thick and composed of anticlinal, moniliform rows of coloured cells enclosing utricle in various stages of development and size, from  $36\mu$  long and  $18\mu$  broad to small ones (Fig. 1). The utricles are more or less broadly rounded at their upper end; when seen from above they are entirely surrounded by coloured cells, compare the surface view of the thallus (Fig. 2). The inner cortex is not much developed and is composed of thin interwoven filaments. On its inner side numerous thin filaments are found, running as a rule in the direction of the central axis, which in the adult thallus is about  $230\mu$  thick. The cystocarps are almost spherical with a rather long

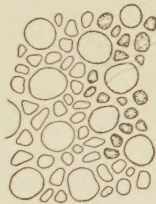


Fig. 2. *Gloiophloea fascicularis* Boergs. Surface view of thallus ( $\times 300$ ).

carpostomium; their diameter is about  $160\mu$  and their length, together with the neck, about  $225\mu$ ; the neck alone is about  $70\mu$ . The cystocarps are thus a good deal larger than those of *G. Okamurai*. The plant is monoecious, the antheridial sori forming irregularly shaped, more or less continuous layers on the surface of the thallus.

#### GELIDIACEAE.

***Gelidium heteroplatos* Boergs., sp. nov.**; ab affini *G. crinali* (Turn.) Lamour. thallo latiore et magis compresso, ramificatione magis evoluta, tetrasporangiis in superficie partis planae thalli et pinnis nidulantibus imprimis differt.

Thallus caespitosus, 5–6 cm. altus, e filis repentibus intricatis et filis erectis compositus. Fila erecta e partibus teretibus et planis alternantibus formata, ad  $600\text{--}700\mu$  lata, irregulariter ramosa, ramis subpinnatis aut oppositis aut alternantibus, apicibus acutis. Tetrasporangia in thalli parte superiore in superficie partis planae et pinnis praesentia.

INDIA: Bombay, Malabar Hill; in the littoral zone on rocks facing the Arabian Sea, Boergesen 5275 (type).

The plant (Plate I and Fig. 3) forms dense tufts upon the rocks about 5–6 cm. high. The thallus is alternately almost terete and compressed, the flat parts reaching a breadth of up to about  $600\text{--}700\mu$ . The filaments are distichously but very irregularly



ramified, the branches being alternate or secund or sometimes opposite. The branches are given out at more or less acute angles ; they are narrow at the base, sometimes nearly terete, but as a rule compressed, broadening out upwards and finally tapering near the generally acute summits.

Seen from above the peripheral cells are oval-roundish about  $4-6\mu$  in diameter, in transverse section they are oval-oblong about  $12\mu$  long and  $6\mu$  broad. Below these cells 3-4 layers of coloured oval-roundish cells are found, the innermost, the larger ones, elongated cylindrical. The uncoloured medullary tissue consists of long subcylindrical intertwined cells of variable size between which run rhizoids.

The tetrasporangia occur scattered on the upper more or less compressed branches and pinnules (Fig. 3b). They take their origin from cells in the coloured layer under the peripheral cells. They are about  $26\mu$  broad and  $42\mu$  long.



Fig. 3. *Gelidium heteroplatos* Boergs.  
a, habit ( $\times 2$ ); b, branchlet with tetrasporangia ( $\times 12.5$ ).

This plant is related to forms of *G. crinale*, but it differs from this species in its usually much broader thallus and in the tetrasporangial sori covering the surface of the upper branches and branchlets. *Gelidium crinale* f. *luxurians* (Phycotheca Bor.-Am., no. 1138) is perhaps the form most nearly related to the Indian plant.\*

\*I am very much indebted to M. le docteur J. Feldmann, Paris, for sending some fine material of related forms for me to compare with this and the following species.

**Gelidium corneum** (Huds.) Lamour. Essai . . . Thalassiphytes, 41 (1813) ; Bornet, Algues Schousboe, 270 ; Boergesen, Mar. Alg. D.W.I. 4, 114, fig. 124.—*Fucus corneus* Huds., Fl. Angl. 585 (1778) ; Turner, Fuci, 4, 146, t. 257a.

INDIA : Bombay, Malabar Hill in rather exposed localities near low water mark ; Back Bay (near Wilson College) in a sheltered locality.

*Distr.* Widely spread.

Most of the Indian specimens agree quite well with my figure quoted above, but the thallus of the Indian plant is a little broader, and its colour is red not purple, as in the West Indian plant. The specimens in one of my collections had short roundish-oval tetrasporic ramuli somewhat recalling Kützinger's figures of *Gelidium micropterum* from the Cape (Kütz. Tab. Phyc. 18, 59).

**Echinocaulon myriocladum** Boergs. sp. nov. ; ab *E. setaceo* Feldm., cui facie persimili, thallo tenuiore et interdum compresso, colore in speciminibus exsiccatis obscure violaceo imprimis differt.

*Frons* caespitosa, 1–2 cm. alta, e filamentis 60–160 $\mu$  latis, teretibus aut compressis irregulariter ramosis et valde intricatis composita. *Rami* distichi, alternantes, seriati aut oppositi, breves vel longiores, plus minus divaricati, summis acutis. *Tetrasporangia* circiter 27 $\mu$  lata et 38 $\mu$  longa, in stichidiis inflatis 100–200 $\mu$  latis praesentia, in seriebus transversalibus 3–4–6 sporangia continentibus ordinata.

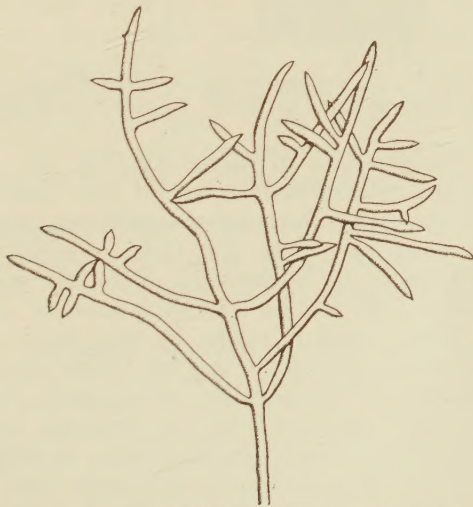


Fig. 4. *Echinocaulon myriocladum* Boergs. Part of thallus ( $\times 13$ ).

INDIA : Bombay, Malabar Hill, on rocks in exposed places near high water mark, *Boergesen* 5235 (type).

The plant (Fig. 4) is terete or somewhat compressed and most irregularly ramified, the branches being either alternate or opposite or uniseriate and of very variable length. The filaments are felted together and often attached to each other by groups of congenital



rhizoids, and by this means also the basal filaments are fastened to the rocks. The ends of the filaments are conically attenuated. The colour of the dried plant is violet-blackish ; in water it is red-violet.

The surface cells, as a rule, are without any order, sometimes, though, showing a tendency to being arranged in rows. They are roundish and about  $5-6\mu$  broad. The tetrasporangia occur in the inflated upper ends of the filaments in horizontal rows containing

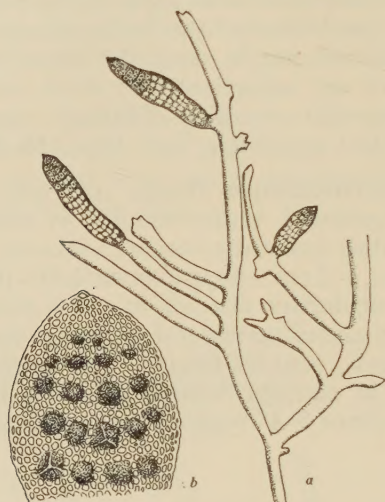


Fig. 5. *Echinocaulon myriocladum* Boergs.  
a, part of thallus with stichidia ( $\times 22.5$ ); b, part of a stichidium ( $\times 150$ ).

3-6, as a rule 4, sporangia in each row (Fig. 5). This peculiar arrangement of the tetrasporangia has of late been described by Feldmann as occurring in *Echinocaulon ramellosum* (Kütz.) J. Feldm. and in *Gelidium pannosum* Born. non Grün. referable to the genus *Echinocaulon* (compare J. Feldmann: Note sur quelques algues marines de Tunisie, in Station Océanographique de Salammbô, Notes, no. 24, 1931); and it might be expected to be found in *Echinocaulon setaceum* and other species hitherto only known as sterile. On account of this peculiar arrangement Feldmann asks whether these plants ought not to be removed from the genus *Echinocaulon*, but he concludes that it is better to keep them in this genus on account of their anatomical structure and because in *E. ramellosum* the seriate arrangement of the tetrasporangia is not always visible, and furthermore because this arrangement is also found in a species of *Gelidium*: *G. melanoideum* Schousboe.

The Indian plant seems to be closely related to the West Indian *Echinocaulon setaceum*; but the West Indian species has been found in a sterile condition only and, after adding to this the differences mentioned above and their different geographical distribution, I prefer to keep them separate.



## CORALLINACEAE.

**Amphiroa fragilissima** (L.) Lamour. Hist. Polyp. Corallig. Flexib. 298 ; Areschoug in J. Agardh, Spec. Alg. 2, 531 ; Weber van Bosse and M. Foslie, The Corallinaceae of the Siboga-Exp. 89, pl. xvi, figs. 1, 2, 5.—*Corallina fragilissima* L. System. Nat. ed. 12, 1, 1305.

INDIA : Bombay, Colaba, Back Bay.

*Distr.* West Indies and warm Atlantic Ocean, Mediterranean Sea, Indian Ocean, Malay Archipelago, Pacific Ocean.

In the specimens which I have gathered of this species the joints were rarely swollen or not at all, neither at the base nor at the top. As a rule the central strand has about 5–6 rows of long cells (about 70 $\mu$  long) interrupted by a row of short cells about 19 $\mu$  long.

**Amphiroa anceps** (Lamk.) Decne. Sur les Corallines (Ann. Sc. Nat. 2, sér. 2, t. 18, p. 125) ; Harvey, Nereis Australis, 98, t. 37 ; Weber van Bosse and M. Foslie, The Corallinaceae of the Siboga Exp. 93.—*Corallina anceps* Lamk. Mém. du Mus. 2, 238 (1815).

INDIA : Karachi, J. A. Murray (Herb. Kew) ; Dwarka, where I have gathered it in tide pools.

*Distr.* South Africa, West Australia, Japan, Malay Archipelago.

The Indian specimens seem to agree very well with the description of Dr. Weber van Bosse. In the specimens examined by me the central strands have 3–4 long cells (about 90 $\mu$  long) and one short cell about 33 $\mu$  long. The upper joints in some of the specimens from Dwarka are very much elongated and slender, up to about 1½ cm. long and about 1 mm. broad. In these filaments the central strand was composed of 3–4 rows of long cells (about 70 $\mu$  long) and one short cell (about 15 $\mu$  long). Most probably these specimens come near to the form called *Amphiroa nobilis* by Kützinger (Tab. Phyc. 8, 51) referred by Mme. Weber to *Amphiroa anceps*.

**Corallina officinalis** L. Fauna Suecica, 539 (1761).

INDIA : Karachi, J. A. Murray (Herb. Kew).

*Distr.* Arctic Sea, Atlantic Ocean, Mediterranean Sea, Black Sea, Japan.

A few small specimens mounted together on a piece of paper are present in the collection of the Kew Herbarium. They are mostly sterile, only a few young conceptacles are present. The Indian specimens seem to me to show much likeness to some specimens from Japan which the late Professor Yendo has sent to me ; compare too Yendo's Fig. 11 (Pl. III) in his paper "Corallinae verae Japonicae" (Journ. Coll. Science, Tokyo, 16 : 1902).

**Jania rubens** (L.) Lamour. Hist. Polyp. Corallig. Flex. 272 (1816) ; Areschoug in J. Agardh, Spec. Alg. 2, 557.—*Corallina rubens* L. Syst. Nat. ed. 12, 1, 1305.

INDIA : Dwarka.

*Distr.* West Indies, Atlantic Ocean, Mediterranean Sea, Red Sea, Natal, Malay Archipelago.

Of this species I have gathered some sterile specimens. Their thallus is about  $150\mu$  thick. They formed dense intricate tufts upon steep rocks in pools.

#### GRATELOUPIACEAE.

**Cryptonemia Lomation** (Bertol.) J. Agardh, Spec. Alg. **2**, 227; Epicr. 165.—*Fucus Lomation* Bertol. Opusc. Sc. Bot. **2**, 289 (not seen); Amoenitates Ital. 289, t. iv, fig. 3 (1819).<sup>1</sup>

INDIA : Karachi, N. M. Paul (Herb. Kew).

Distr. Mediterranean Sea ; Aru Islands.

A single specimen which seems referable to this species is found in the collections of the Kew Herbarium. Unfortunately the specimen is sterile, but its whole appearance as well as its anatomical structure quite agrees with the descriptions. Larger and smaller proliferations issue from the edges of the older parts of the thallus. Mme. Dr. Weber van Bosse in her Liste Alg. Siboga p. 248 mentions this species from Iles Jedan, Ile Aru, and considering that several Mediterranean species have been found in the northern part of the Arabian Sea, it does not seem strange that this species should occur here.

#### GRACILARIACEAE.

**Corallopsis Cacalia** J. Agardh, Spec. Alg. **2**, 583 ; Epicrisis, 409.—*Corallopsis Salicornia* Decne. Plantes Arab. 184.

INDIA : Okha Port, cast ashore. Karachi, K. G. Naik.

Distr. Red Sea, north coast of Java, Thursday Island.

A few specimens of this species (Fig. 6) originally described from the Red Sea, were found. The lower part of the thallus is irregularly ramified, and at their base the main branches are very little attenuated or not at all. The summits of the branches swell, and



Fig. 6. *Corallopsis Cacalia*. J. Ag.  
a, part of thallus ( $\times 75$ ); b, apex of branchlet ( $\times 1.5$ ).



from the depression in the middle one or sometimes two branchlets are given out. These branchlets are elongated clavate in shape, about 0.5 mm. broad at their base, 2-2.5 mm. at their summits, from which again other similar but smaller branchlets issue. Furthermore such adventitious branchlets are given out occasionally from all parts of the thallus (compare Fig. 6). A transverse section shows a thick cuticle and below it a narrow assimilating tissue composed of 1-3 layers of small cells about 4-6 $\mu$  thick and under that a parenchymatic tissue the cells of which next to the periphery are still small and contain a few scattered chromatophores, but they quickly increase in size towards the middle of the thallus. The specimens are tetrasporic. The almost globular tetrasporangia are formed in the assimilating tissue; they are cruciately divided and are found scattered over the surface of the thallus. Cotton (K.B.) 1913, 253) has earlier found tetrasporangia in *Corallopsis Urvillei* (Mont.) J. Ag.; they occurred together with systocarps in the same specimen and are produced in special short pedicellate lateral branches.

**Gracilaria arcuata** Zan. Plant. in Mar. Rubr. Huc. Collect. Enumer. 57, t. iii. fig. 2 (1858); Weber van Bosse, Algues Siboga, 429; Feldmann, Notes sur quelques Alg. Mar. de Tunisie (Station Océanograph. de Salammbô, Notes nos. 24, 14, figs. 4-6: 1931)—*Gracillaria dumosa* Harv. Friendl. Isl. Alg. no. 37; Grunow, Alg. Fidschi-, Tonga- und Samoa-Inseln, 42; *Sphaerococcus dumosus* Kütz. Tab. Phyc. 19, 21, figs. e-f.

INDIA: Karachi 1882, J. A. Murray (Herb. Kew), Manora, near Karachi, Miss L. Frere (Herb. Kew.); K. G. Naik.

*Distr.* Red Sea, Mediterranean Sea, Malay Archipelago, Japan, Pacific Ocean.

In referring some Indian specimens (Plate III) in the collection of Algae of the Kew Herbarium to this species, I must point out that I have not been able to compare them with authentic specimens, but they seem to agree very well with Zanardini's description and figures, having the same irregular ramification with secundly arranged, arcuately bent branches and branchlets. A transverse section near the base of the thallus in one of the specimens shows that the cortical layer is very thick, composed of small lengthened cells placed in rows, there are up to about 8 cells in each row, in some other specimens I have found rows with only 2-4 cells, thus like the fig. f. of Kützing's figures. Higher in the thallus the cortex becomes thinner and in the young part of the thallus a single layer is present only.

In Icones of Jap. Algae 6, 40, pl. 272, Okamura records the presence of this species in Japan. To judge from his figure the Japanese plant is more densely ramified than the plant from the Red Sea and India recalling the var. *Snackeyi* Weber, l.c. 430.

**Solieria robusta** (Grev.) Kylin, Die Florideengattung Gigartinales (Lund's Univ. Årskr. N.F. Avd. 2, **25**, no. 8, p. 18 : 1932).

In part II of these contributions (K.B. 1932, 127) I referred this species to the genus *Agardhiella*, which is like *Solieria* in anatomical structure. Since the publication of my paper Kylin's valuable work quoted above has appeared, in which he points out that in the middle of the gonimoblasts in *Solieria* a large fusion-cell is present, whereas in *Agardhiella* sterile tissue is found instead of this cell. The Indian plant having this large fusion cell must thus be referred to *Solieria*.

In the Kew Herbarium some specimens from Karachi gathered by J. A. Murray, September 1881, are present, in the summits of the branches of which proliferations are to be found. On account of this these specimens were referred to *Solieria dura* (Zan.) Schmitz (= *S. divaricata* (Forssk.) Boergs.). I have compared them with the original specimens found in Forsskål's herbarium in the Botanical Museum, Copenhagen, and have found that they cannot be referred to this species. In my opinion they belong to *Solieria robusta*.

These specimens together with a few others in Miss L. Frere's collection are certainly referable to the var. *Wightii* J. Ag. distinguishable by its compressed thallus, from both sides of which the branches issue. These specimens are also recognizable by the fact that the branches near the base taper rather suddenly to a short thin stipe. Further the anatomy, especially in one of the specimens, is somewhat different from the typical form, the peripheral cells being large and palisade-like about  $30\mu$  long and  $10\mu$  broad, but in some of the other specimens the cells were smaller, forming transitions to the small peripheric cells of the typical form. I wish still to point out that I have not seen any authentic specimen of the var. *Wightii* known from the Bay of Bengal ; but a figure of the original specimen is found in Kylin's above-quoted publication, pl. 5, fig. 10.

**Sarconema furcellatum** Zan. Pl. Mar. Rubr. Enum. 56, t. 8 (1858).

INDIA : Karachi, J. A. Murray (Herb. Kew). Sind coast, N. M. Paul (Herb. Kew). Dwarka (!).

*Distr.* Red Sea.

When I treated of this species in Kew Bulletin, 1932, 126, I referred to it forms both with slender and stouter thalli. Meanwhile Kylin's paper on the Gigartinales has appeared, and following his treatment of the genus I have re-examined the specimens referred by me to *S. furcellatum*, and have come to the conclusion that the stouter specimens from Dwarka and Karachi belong to this species, whereas the slender ones from Bombay are to be referred to *S. filiforme* (Sond.) Kylin. In the specimens from Dwarka the thallus is rather tough and stiff. The basal part is composed of decumbent or creeping filaments woven together and fastened to stones and gravel from which the erect filaments arise, thus reminding one of Zanardini's figure. Near the base the filaments are about 1.75 mm.



thick, decreasing slowly upwards to about 1 mm. My figure 12a, b (l.c.) is from the plant from Dwarka. In this the cells of the parenchymatic tissue are as a rule about 60–70 $\mu$  broad, their diameter only rarely reaching a length of 110 $\mu$ . When compared with the size of the cells in the parenchymatic tissue of *S. filiforme*, it will be seen that these cells in the latter are a good deal bigger, and therefore they might perhaps be another feature, in addition to the robustness of the thallus, by which to separate the two species. The specimens from Karachi belonging to the Kew Herbarium have about the same size of the thallus and a similar anatomical structure. The specimens examined by me were sterile.

**Sarconema filiforme** (Sond.) Kylin, l.c. 22.—*Dicranema filiforme* Sonder in Bot. Zeitung, 1845, 56. *Cystoclonium filiforme* Kütz. Tab. Phyc. 18, 18.

INDIA: Bombay: Back Bay, Malabar Hill. Karachi, 1883, J. A. Murray (Herb. Kew).

Distr. West Australia.

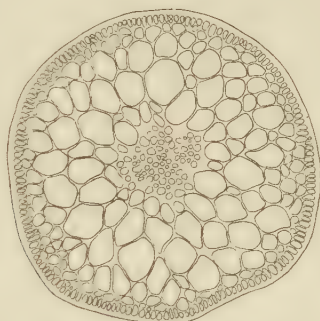


Fig. 7. *Sarconema filiforme* (Sond.) Kylin.  
Transverse section of thallus ( $\times 55$ ).

The specimens, which I refer here to *S. filiforme*, have as mentioned under *S. furcellatum*, been referred to the latter species, but I now agree with Kylin in referring these forms with thinner, more slender thallus to *S. filiforme*. The thallus in these specimens is from about 0.75 mm. to 0.25 mm. or less thick. A transverse section of the thallus (Fig. 7) shows that in spite of its being rather slender the cells in the parenchymatic tissue are rather large, up to 130 $\mu$  broad, thus a good deal larger than those in *S. furcellatum*. The breadth of the central cells is also large, about 15 $\mu$ , and the lumen about 5 $\mu$ . Therefore some differences as to the anatomical characters seem to be present between the two species, but in order to state this finally more material than I have had is necessary. Some of the specimens were tetrasporic; Fig. 12c in Part II, showing a part of a transverse section with tetrasporangia, is from a specimen now referred to this species. A few specimens in the collection of the Kew Herbarium showed some likeness to *Sarconema indicum*

(J. Ag.) Kylin (l.c. 22, tab. 8, fig. 17), as they have a similar ramification to that of the original specimen from India found in Herb. J. Agardh in Lund ; but I doubt whether this species is anything but a form of *S. filiforme*.

**Sarconema furcatum** Boergs., sp. nov. ; a *S. Montagnei* (Grun.) Kylin differt imprimis thallo e basi ad summum paene aequicrasso et regularius dichotomo, thalli substantia molliore et magis carnosâ, colore carneo-lutescente.

*Thallus* caespitosus, ad 20 cm. altus, indentidem furcatus et dichotomo-fastigiatus, inferne circiter 1 mm. crassus, sursum leniter attenuatus ad 0.5 mm. crassus, summis acutis, in parte adultiore thalli proliferationibus interdum praesentibus. Specimina exsiccatione chartae bene adhaerent.

INDIA : Karachi, J. A. Murray (Herb. Kew.) ; A. B. Kotwall (Herb. New York Bot. Garden and Herb. F.B.).

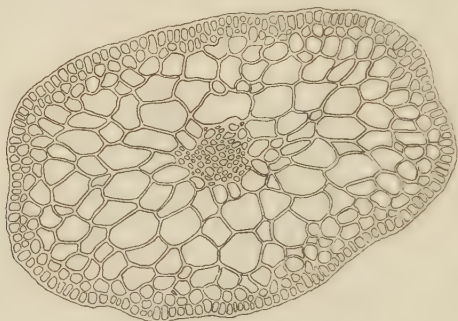


Fig. 8. *Sarconema furcatum* Boergs. Transverse section of thallus ( $\times 55$ ).

The thallus (Pl. II) is most certainly compressed, but it must be taken into consideration that only dried material was available for examination. A transverse section (Fig. 8) shows that the peripheral cells are large, oblong, about  $20\mu$  long and about half as broad ; the parenchymatic tissue is composed of rather big cells the diameter of which is about  $100-130\mu$ . The central tissue is small, about as big as the lumen of one of the larger cells in the parenchymatic tissue. The breadth of a single filament is about  $18\mu$  and its lumen about  $7\mu$ . Found in sterile condition only. The most characteristic features of this species are its thallus which hardly tapers, keeping almost the same size from base to near the summits of the filaments and its somewhat dirty, yellowish-carnose colour in the dried condition.

**Sarconema scinaoides** Boergs. sp. nov. ; *S. furcellato* Zan. proximum ; differt praesertim thallo crassiore et magis regulariter furcato, substantia magis carnosâ.

*Frons* caespitosa, teretiuscula, repetitive regulariter dichotoma, 14 cm. alta et ultra (?), inferne circiter 1-1.5 mm. crassa, in media parte thalli circiter 2 mm. crassa, ad apicem sensim attenuata,



PLATE II



*Sarconema furcatum* Boergs. sp. nov. (above).

*Sarconema scinaoides* Boergs. sp. nov. (below).





apicibus acutis. *Color* obscure purpureus. *Substantia* verisimiliter gelatinoso-carnosa, ita ut planta exsiccatione chartae arctissime adhaerent. *Fructus* ignoti.

INDIA : Karachi, *A. B. Kotwall* (Herb. New York Bot. Garden). Manora, near Karachi, Miss *L. Frere* (Herb. Kew).

This species is easily separated from the hitherto known species of *Sarconema* by its thick thallus (Pl. II), which is of a fleshy consistency and adheres strongly to paper. A transverse section (Fig. 9) shows that there is a thick cuticle ; the peripheral cells are

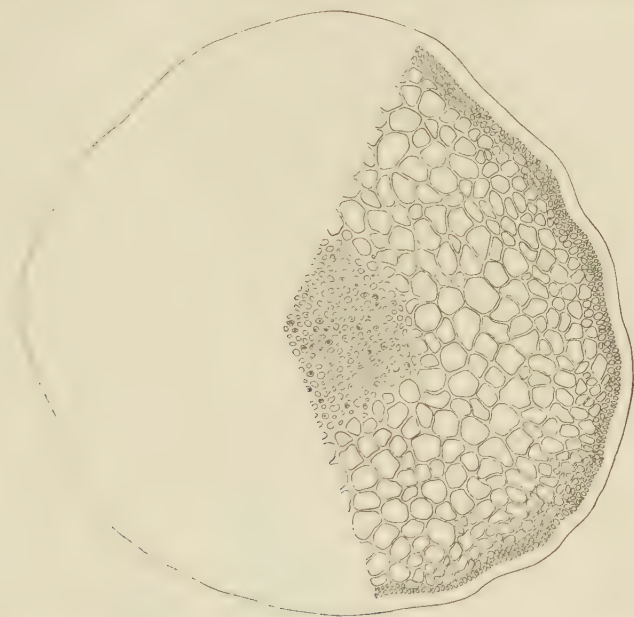


Fig. 9. *Sarconema scinaoides* Boergs. Transverse section of thallus ( $\times 60$ ).

small, oblong, about  $12\mu$  passing evenly over into a colourless parenchymatous tissue of rather small cells ; the largest measured by me had a diameter of  $90\mu$ , but on an average their diameter was about  $50\text{--}60\mu$ . The central filaments form together a rather thick tissue, in transverse section about  $330\mu$  thick. It is composed of numerous thick-walled filaments about  $10\text{--}15\mu$  thick. In the Kew Herbarium some specimens are present, which perhaps may be referred to this species ; transverse sections of the thallus show that they belong to the genus, but they differ from that of the plant described by somewhat longer cells and thinner cuticle. These specimens were gathered at Karachi by *J. A. Murray*.

**Meristotheca papulosa** (*Mont.*) *J. Ag.* Bidr. Florid. System. 143 ; *Epicrisis*, 584 ; *Weber*, *Algues Siboga*, 402, fig. 152 ; *Kylin*, *Florideenordn. Gigartinales*, 25, pl. 12, fig. 27 (1932).—*Callymenia papulosa* *Mont.* Pug. Alg. Yem. in *Ann. Sc. Nat.* 3, sér. 13, 246. *Euhymenia papulosa* *Kütz.* Tab. Phyc. 17, 73.

INDIA : Karachi, March 1882, *J. A. Murray* (Herb. Kew), *A. B. Kotwall* ; Manora near Karachi, *Miss L. Frere* (Herb. Kew).

*Distr.* Red Sea, coast of Somali, Malay Archipelago.

To this, as it seems to me most variable species, I refer a few specimens found in the collections examined by me. At first I thought the specimens were to be referred to *M. japonica* Kylin, as they are much larger than Kützing's specimen of *M. papulosa* figured in *Tabulae Phycologicae* and the specimen from Agardh's Herbarium from which Kylin has reproduced his figure. But after having been able to examine Kützing's authentic specimen and some other specimens belonging to Hauck's Herbarium most kindly lent to me by Mme. Dr. Anna Webervan Bosse, I am of the opinion that the Indian specimens are referable to *M. papulosa*, although the specimens are larger and even though one of the specimens at least has thicker thallus.



Fig. 10. *Meristotheca japonica* Kylin. Female specimen ( $\times 5$ ).

Kylin points out that the difference between the two species is that the thallus is thicker and more cartilaginous in *M. japonica* than in *M. papulosa* ; that this is generally so I have been able to confirm by means of a very fine collection of the Japanese plant belonging to the Kew Herbarium. When comparing the Japanese specimens with those from the Red Sea, Somaliland and the Arabian Sea it will be seen that the structure of the thallus is about

the same. Transverse sections of the thallus in specimens from both areas show at the periphery a layer of small, assimilating cells passing evenly over into larger roundish storage cells, the innermost being the largest and oval; in the middle there is a medullary tissue of loosely interwoven filaments (comp. Okamura, Icon. Jap. Alg. 5, pl. 235, fig. 11). The only difference is that in most of the Japanese specimens the thallus is thicker and the cells larger. But transitional forms occur. Thus in the collection of the Kew Herbarium a specimen from Mogi, comm. J. Matsumura 1910 and determined by Cotton and Yendo as *Eucheuma papulosa* has a much thinner thallus, quite as thin as the Indian specimen and the same is the case with a tetrasporic specimen from Misaki sent from Yamada and incorporated in the Herbarium of the Bot. Museum, Copenhagen; this specimen has too a rather thin thallus not much thicker than that of the Indian specimens and with small cells also. In my opinion the two species are very closely related, and Cotton and Yendo (K.B. 1914, 220) also considered the Japanese form as belonging to *Meristotheca papulosa*, or *Eucheuma papulosa* as the plant was named by these investigators. In this connection I wish to point out that the geographical distribution seems to be of small importance as several other Japanese algae have been found in the northern part of the Arabian Sea; but to decide the question definitely more material is necessary.

Altogether I have been able to examine three Indian specimens, two of which belong to the Kew Herbarium and one to the collection of algae sent to me for determination from the New York Botanical Garden. One of the specimens, apparently only a part of a plant,

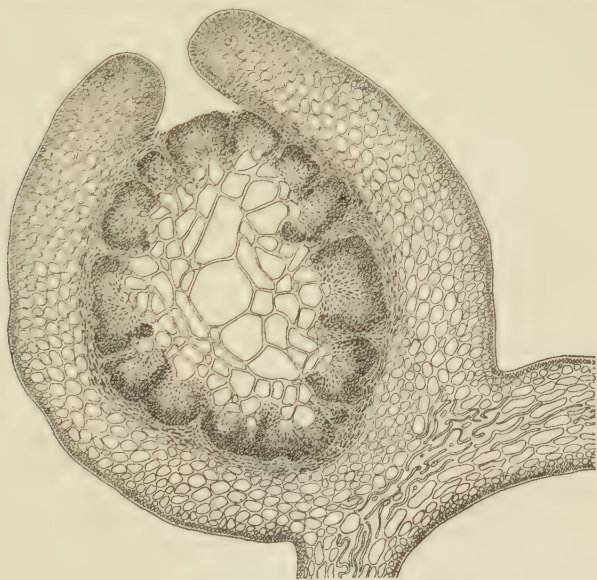


Fig. 11. *Meristotheca papulosa* (Mont.) J.Ag.  
Longitudinal section of a cystocarp ( $\times 33$ ).



is female. It consists of a flat piece about 14 cm. long and 4–5 cm. broad (Fig. 10) ; its margin is irregularly sinuate and dentate. In its upper end a larger incision is found and from the upper end of the lobes on both sides of the incision several proliferations, up to 5 cm. long, arise. The consistency of the rather thick thallus is cartilaginous and its colour is brick red. Along the margin and scattered upon the flat surface large, nearly spherical, very much protruding cystocarps are present. And among these are numerous procarps like small papillae, in various states of development (compare Kylin's Fig. 5c). A longitudinal section of a cystocarp (Fig. 11) shows in the middle of the gonimoblasts a sterile perenchymatic tissue of cells larger in the middle smaller towards the periphery, from which the spore-building filaments issue forming roundish bodies and interrupted by bundles of sterile filaments ; the wall of the cystocarp is thick, with an opening above. A transverse section of the cystocarp has already been given by Mme. Weber, p. 403, fig. 152. Another specimen, belonging to the Kew Herbarium, is tetrasporic. The thallus of this specimen is a little thinner than the female one. Along the irregularly sinuated and dentate margin numerous proliferations are found and several issue too from the surface of the thallus ; here also short, scattered processes occur. The tetrasporangia are found spread over the surface and are zonately divided. Still another specimen, a sterile one, is found in the Kew Herbarium. It is a somewhat larger and broader specimen, the thallus of which is irregularly subdichotomously divided several times with rounded axils between the lobes. Its margin is irregularly sinuate and dentate and a few proliferations are present. The surface of the thallus is glabrous. The colour of this specimen is lighter brick red with scattered darker spots, and it is most probably a bleached one that has been found cast ashore.

#### RODOPHYLLIDACEAE.

**Cystoclonium purpureum** (Huds.) Batters, Catal. Brit. Mar. Alg. 68 (1902) ; Rosenvinge, Mar. Alg. Denm. 589 (1931).—*Fucus purpureus* Huds. Fl. Angl. 471 (1762). *Cystoclonium purpurascens* Kütz., Phyc. gen. (1843) 404 ; Kylin, H., Entwicklungsgesch. der Florideen (K. Svenska Vetensk. Handl. 63, 22, 1923). For more literature see Rosenvinge, l.c.



Fig. 12. *Cystoclonium purpureum* (Huds.) Batters. Apex of thallus ( $\times 600$ ).

INDIA : Karachi, *J. A. Murray*, June 1883 (Herb. Kew).

*Distr.* North Atlantic, European and American coasts.

In the collections belonging to the Kew Herbarium several specimens of an alga (Plate IV) are present, which, although they are sterile, I do not hesitate to consider as belonging to this species, to which they had also been provisionally referred by a former investigator. As described by Kylin and later by Rosenvinge, *C. purpureum* increases by an apical cell which, by means of oblique walls, gives off segments below, alternately to right and left. As Fig. 12 shows, this is also the case in the Indian plant. A transverse section of the Indian plant agrees, too, with that of *C. purpureum* (compare for instance Kylin, l.c. p. 23-24, fig., 14c) having a peripheral assimilating layer of oblong densely placed cells and below that a storage tissue consisting of nearly isodiametric cells nearest the peripheral ones, then more lengthened cells and in the middle a medullary tissue composed of long, hyphae-like cells. The hairs were not observable and tendrils were not present. Near the base of the main stem of one of the specimens the characteristic decumbent branchlets of this species were present (Plate IV).

The occurrence of this species so far from its hitherto known distribution is of much interest.

#### HYPNEACEAE.

***Hypnea musciformis*** (*Wulf.*) *Lamour.* Essai. Thalassioph. 43.—*Fucus musciformis* Wulf. in Jacquin, Collectanea, 3, 154, tab. 14, fig. 3 (non vidi). For further synonymy see De Toni, Syllog. Alg. 4, 472.

INDIA : Karachi, *J. A. Murray* (Herb. Kew) ; Manora, *Miss L. Frere* (Herb. Kew).

*f. denudata* Kütt. Tab. Phyc. 18, 21.

Karachi, *J. A. Murray* (Herb. Kew) ; *A. B. Kotwall* (Herb. New York Bot. Gard.).

*Distr.* Most warm seas.

This species is common along the shores of India. In the collection of Algae belonging to the Kew Herbarium several typical specimens richly provided with tendrils are present. Some specimens of *f. denudata* are also found in the Kew Herbarium.

***Hypnea Valentiae*** (*Turn.*) *Mont.*, *J. Agardh*, Spec. Alg. 2, 540 ; *Hauck*, Ueber ein. v. I. M. Hildebrandt im Rothen Meere u. Ind. Ocean gesamm. Algen in Hedwigia 26, 20, 1883.

INDIA : Karachi, *J. A. Murray* (Herb. Kew). Bombay, Malabar Hill, Back Bay. Tuticorin, Hare Islands.

*Distr.* Most warm seas.

In the paper quoted above *Hauck* points out that several forms formerly considered as species and all distinguishable by means of more or less densely placed branchlets on the main branches belong to this species. Furthermore stellate bulblets are often present. I agree with *Hauck's* treatment of these forms, for such a changeable

alga as *Hypnea* with its great ability for making new shoots everywhere will certainly be much influenced by various external conditions. The Indian specimens which I refer to this species are also rather variable, but they all agree in having more or less densely placed short branchlets along the main branches.

***Hypnea spicifera*** (Suhr.) Harv. in J. Agardh, Alg. Liebm. 14; Spec. Alg. 2, 445; Epicrisis, 562; Kütz. Tab. Phyc. 18, 29.—*Gracilaria spicifera* Suhr in Flora 2, 731, t. 2, fig. 14 (1834). *Hypnea spicigera* Harv., Ner. Australis, t. 49. *Hypnea Harveyi* Kütz. l.c. 28.

INDIA: Karachi, A. B. Kotwall (New York Bot. Garden). Karvar, Bengi Bay.

*Distr.* Cape.

In the collection of algae from Karachi belonging to the New York Bot. Garden two specimens are found which I think are referable to this species. One of these is a female plant, the other is sterile. Both specimens are covered with ramuli and short branchlets from the upper ends of the main branches to near their base, thus not having the long naked basal part of the branches generally found in this species. In this respect they are very similar to Kützing's figure of *H. Harveyi*. Some of the specimens from Cape found in J. Agardh's Herbarium in Lund are quite like the Indian specimens. A small rather delicate tetrasporic specimen from South India I think is also to be referred to this species.

#### CERAMIACEAE.

***Centroceras\* clavulatum*** (Ag.) Mont., in Exploration Scientifique de l'Algérie, Algues, 140 (1846); J. Agardh, Spec. Alg. 148; Epicrisis, 108.

INDIA: Karachi, J. A. Murray, N. M. Paul (Herb. Kew). Dwarka. Bombay: Back Bay, Malabar Hill, Bandra, Karvar. Tuticorin: Hare Island.

*Distr.* All warm seas.

Several forms are present, some with many spines, some with few or only a single one at each joint, but quite spineless forms, referable to *C. cinnabarinum*, were not found in the collection.

***Ceramium miniatum*** Suhr. MS. in J. Agardh, Spec. Alg. 2, 135; Analecta Algologica, Contin. 2, p. 18; Harvey, Phycologia Australica, t. 206 A.

INDIA: Karachi, J. A. Murray and N. M. Paul (Herb. Kew). Bombay: Malabar Hill, Bandra.

*Distr.* Peru, West and East coasts of Australia.

In "The Marine Algae of Peru" (Memoirs of the Torrey Bot. Club, 15: 1914) p. 157, Howe says that he doubts whether the plant figured by Harvey in the above-quoted work really belongs to

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\*Dr. H. E. Petersen has most kindly determined the species of this genus and of *Ceramium*.



this species. But Dr. H. E. Petersen tells me that he is certain Harvey's plant represents *C. miniatum*, though he has not seen authentic material. The Indian specimens agree well with Harvey's figure and likewise with specimens determined by J. Agardh.

**Ceramium gracillimum** Griff. et Harv., Phycologia Britannica, t. 206. J. Agardh, Epicrisis, 95; Analecta Algol., Contin. 2, p. 43.—*Ceramium byssoideum* Harv. Nereis Bor. Am. 218. *Ceramium transversale* Collins and Hervey, Alg. Bermuda, 145, pl. v, figs. 29–31; Boergesen, Marine Algae in Ostenfeld, Plants from Beata Island, St. Domingo in Dansk. Bot. Arkiv. 4, no. 7, 27.

INDIA: Tuticorin, Hare Island.

*Distr.* Most warm seas.

Most probably *Ceramium gracillimum* is the correct name for this species, but Dr. H. E. Petersen tells me it is desirable to see authentic material. In Britton, "Flora of Bermuda," (1918) Howe states (p. 531) that *C. transversale* is to be referred to *C. byssoideum*. Compare too my remarks in the paper quoted above.

**Ceramium rubrum** (Huds.) Ag. var. *virgata* Ag. Spec. Alg. 2, 149. J. Agardh, Spec. Alg. 2, 128; Epicrisis, 100.—*Ceramium vimineum* J. Agardh, Analecta Algologica, Contin. 2, p. 38.

INDIA: Karachi, J. A. Murray (Herb. Kew).

*Distr.* The Arctic Sea, Western coast of Europe to the South of Cadiz, Brasilia; "*in mari australi*" (J. Ag.).

Two well preserved specimens of this form of *Ceramium rubrum*, widely spread in the Arctic Sea and in the Northern Atlantic Ocean, are present in the collection of algae belonging to the Kew Herbarium. Their occurrence in the Arabian Sea is therefore rather astonishing. According to Dr. H. E. Petersen the specimens agree very well with specimens, for instance, from Denmark, the Faroes and Iceland.

#### DELESSERIACEAE.

**Nitophyllum punctatum** (Stackh.) Grev. Alg. Brit. 79; Harvey, Phyc. Brit. pl. 202; Kylin, Studien über die Delesseriaceen in Lund's Univ. Årskr. N. F. Avd. 2, 20, no. 6, p. 69, 1924.—*Ulva punctata* Stackh. in Linn. Transact. 3, 230.

INDIA: Karachi, March 1882 and June 1883, J. A. Murray (Herb. Kew); Miss L. Frere (Herb. Kew); A. B. Kotwall (Herb. New York Bot. Gard.).

*Distr.* Warmer Atlantic Ocean, Mediterranean Sea.

In the collection of the Kew Harbarium several fine specimens from the Indian Ocean are found which I do not hesitate to refer to this species. Besides sterile ones, tetrasporic and cystocarpic specimens are present. The oblong-roundish tetrasporangial sori and the cystocarps are scattered over the surface of the thallus. As far as I have been able to see on dried material the carpospores are placed terminally upon the gonimoblasts, one of the characters by means of which the *Nitophyllum* group, according to Kylin, is

separated from the *Myriogramme* group. Furthermore the specimens all agree in having a thin membranaceous rosy-red thallus without veins; it adheres well to paper. Upwards the thallus is monostromatic, near the base it is composed of 3–4 layers of cells; the plant has a quite short stipe and is fixed by means of a small irregularly shaped disc. It forms more or less dense tufts. A number of incisions, generally deep, divide the thallus into lobes, which are linguiform or subcuneate with broader upper ends. The upper margin of the thallus is sinuate or emarginate. In some specimens the side of the lobes along the incisions is entire without proliferations; in others proliferations are found in great numbers. As a rule the proliferations are forked or sinuate at their upper ends.

#### RHODOMELACEAE.

**Laurencia obtusa** (Huds.) Lamour. Essai . . . Thalassioph. 42.

INDIA : Karachi, J. A. Murray (f. *typica*) (Herb. Kew). Dwarka, var. *divaricata*.

*Distr.* All warm seas; var *divaricata* : Red Sea, var. *majuscula* : West Australia.

Besides the var. *majuscula* mentioned in Part III (K.B. 1933, 135) some specimens are to be found in the collection of algae at Kew, which are to be referred to the typical *L. obtusa*. Furthermore I have collected at Dwarka a few specimens of var. *divaricata* (J. Ag.) Yamada (l.c. 223, t. 16 a). In the medullary tissue of this variety lenticular thickenings are not present, and the surface cells in transverse section are almost square and not projecting.

**Laurencia filiformis** (Ag.) Mont., Voyage Pol. Sud, 125; J. Agardh, Spec. Alg. 2, 745; Epicrisis, 644; Yamada, Y. Notes on Laurencia, 226, pl. 18, fig. a.

INDIA : Manora, near Karachi, Miss L. Frere (Herb. Kew).

*Distr.* South and West Australia.

To this species I refer a fine well-prepared specimen in Miss L. Frere's collection. The specimen has a rosy-red colour. It reaches a height of about 14 cm. (the base is missing) and is of an even thickness from base to top. The ramification is rather irregular; in the lower part the branches issue on all sides or alternately, in the upper part they have a tendency to become secund. Regarding the anatomy the surface cells are not protruding, being about as long as broad with a rather thick cuticle; lenticular thickenings are not found. This description shows that the Indian plant agrees well with the description of the species, and a comparison with specimens from West Australia, determined by J. Agardh and preserved in the Botanical Museum, Copenhagen, confirms this.

**Laurencia hypnoides** Boergs. A revision of Forsskåls Algae . . . , in Dansk. Bot. Arkiv, 8, no. 2, p. 3 (1932).—*Chondria seticulosa* C. Agardh, Spec. Alg. 345. *Laurencia seticulosa* Grev. Alg. Brit. Synop. p. lii. J. Agardh, Spec. Alg. 2, 758; Yamada, Notes on

PLATE III



*Laurencia platyclada* Boergs. sp. nov. (above).  
*Gracillaria arcuata* Zan. (below).





Laurencia, 217. According to a specimen in Forsskål's Herbarium, bearing his original label, this species is not the same as *Conserva seticulosa* Forssk. Flora Aegypt.-Arab. 188 (= *Hypnea musciformis* (Wulf.) Lamour).

INDIA : Karachi, A. B. Kotwall (Herb. N. York Bot. Gard.).  
Tuticorin : Hare Island.

*Distr.* Red Sea.

In the collection of algae from Karachi belonging to the New York Botanical Garden, two specimens are present which are referable to this species. I have compared them with specimens in J. Agardh's Herbarium in Lund collected by Forsskål in the Red Sea and found that they agree very well with these, as well as with Kützinger's figure (Tab. Phyc. 15, 52). The specimens have a yellowish-green to brown-red colour and adhere strongly to paper. Short fructiferous almost cylindrical or subclavate branchlets are given out from the branches on all sides, as shown in Kützinger's figure. A transverse section shows oblong-roundish peripheral cells and no lenticular thickenings.

To this species I refer too some specimens from South India. These specimens have the same appearance being densely set with short nearly cylindrical fructiferous ramuli.

**Laurencia virgata** J. Agardh, Spec. Alg. 2, 752; Epicrisis, 653; Yamada, Notes on Laurencia, 208 (1931). For synonyms see De Toni, Syll. 4, 793.

INDIA : Karachi, June 1883, J. A. Murray (Herb. Kew); A. B. Kotwall (Herb. N. York Bot. Gard.). Karwar, Bengi Bay.

*Distr.* Cape.

In the collection belonging to Kew some tetrasporic specimens are present determined as *Laurencia* near *L. virgata*. Two specimens of this species are found too in the collection belonging to the New York Botanical Garden. Finally I have a few specimens in my own collection. According to Yamada this species has "a good number of the lenticular thickenings in the walls of the medullary cells in the branchlets." I have not been able to find these in the specimens examined, perhaps because they have been unduly pressed. Otherwise the specimens agree well with Yamada's description. I have also compared them with specimens of this species found in J. Agardh's Herbarium in Lund with which they agree quite well.

**Laurencia platyclada** Boergs. sp. nov.; *L. elatae* formae *flexuosae* Kütz. proxima mihi videtur sed nostra species ramificatione magis irregulari, thallo latiore et cystocarpis per totum thallum sparsis dispositis inter alia differt.

*Thallus* circiter 10 cm. altus, complanatus, 1.5-2.5 mm. latus, irregulariter ramosus. *Rami* e margine, rarius e superficie plana, thalli exeuntes, secundi, alterni vel suboppositi apicibus late rotundati; rami secundarii et ipsis eodem modo ramosi. *Cellulae* in sectione transversali aequilongae, partibus incrassatis lenticulatis

ad parietes cellularum medullae non praesentibus. *Cystocarpia* in superficie thalli irregulariter dispersa, verrucas semiglobosas permagnas formantia. *Ramuli tetrasporiferi* breves, irregulariter cymosi.



Fig. 13. *Laurencia platyclada* Boergs. Part of thallus (natural size).

INDIA : Karachi, A. B. Kotwall (Herb. New York bot. Garden) ; Sind coast, N. M. Paul (Herb. Kew).

This species (Plate III) seems to show some likeness to *Laurencia flexuosa*, Kütz. (Tab. Phyc. 15, 68) but is easily separated from it by means of its somewhat broader thallus and more irregular ramification and its large sessile cystocarps spread over the thallus (Fig. 13). Furthermore I have not succeeded in finding lenticular thickenings in the walls of the medullary cells of the Indian plant. *L. platyclada*, too, may show some likeness to *L. ceylanica* J. Agardh, the North Indian plant having now and then some short tuberculate branchlets ; but these are very numerous and characteristic in *L. ceylanica*, the thallus of which is also much broader. Besides it differs from our species on account of its radially elongate somewhat palisade-like surface cells.

The thallus of *L. platyclada* is flat, about twice as broad as thick. The peripheral cells in transverse section are about as long as broad, their free walls being a little convex. A small piece of a plant in the specimens from the Kew Herbarium is tetrasporic ; the stichidial branchlets are very short and irregularly cymose.

***Acanthophora dendroides* Harv.** in Transact. Irish Academy 22, 538 ; J. Agardh, Spec. Alg. 2, 818.

INDIA : Dwarka ; Karachi, June 1883, J. A. Murray (Herb. Kew).

*Distr.* Ceylon, Malay Archipelago, Australia.

The Indian specimens form tufts up to about 18 cm. high. The main filaments are up to about 2 mm. thick. They are pyramidally



PLATE IV



*Cystoclonium purpureum* (Huds.) Batters. (above).  
*Acanthophora dendroides* Harv. (below).



ramified to all sides, the branches being bent upwards and getting gradually shorter (Plate IV). The branches carry other shorter branchlets. All branches and branchlets are narrowed at their base, but soon attain their normal thickness remaining so almost until they end in the broadly rounded apex, from the cavity of which the trichoblasts protrude (Fig. 14). Here and there, especially near the upper ends of the branches and branchlets, a short spine is present. The spines are about  $400\mu$  long and at their base nearly quite as broad. The number of spines is rather variable, in some specimens many are present in others very few, and these specimens recall *Chondria* very much in appearance.



Fig. 14. *Acanthophora dendroides* Harv. Upper ends of branches ( $\times 3$ ).

**Polysiphonia platycarpa** Boergs. sp. nov. ; *P. macrocarpae* Harv. proxima videtur, sed nostra species thallo majore et crassiore, cystocarpis latioribus et brevioribus collo destitutis inter alia distincta est.

*Thallus* caespitosus, usque ad 7 cm. altus, ecorticatus, tetrasi-phonius, articulatus, e filamentis decumbentibus rhizoideis substrato adfixis et filis erectis compositus. *Filamenta basalia* circiter  $200\mu$  lata, articulis duplo fere longioribus, ad geniculas leviter incrassatis, parietibus externis crassioribus. *Filamenta erecta* in media parte thalli circiter  $70-80\mu$  lata, articulis 3-4-plo longioribus, sursum leniter attenuata. *Ramificatio* irregularis, sparsa, ramis extra-axillaribus trichoblastorum locum tenentibus erectis, angulis acutis. *Tetra-sporangia* ovalia, circiter  $65-77\mu$  lata et  $85-100\mu$  longa, in superiore parte ramorum et ramulorum orta et in serie longa spiraliter ordinata. *Antheridia* subcylindrica,  $200\mu$  longa et  $38\mu$  lata, superne sine cellula sterili. *Cystocarpia* sphaerico-urceolata, ostiolo lato non protracto munita.

INDIA : Bombay, *Boergesen* 5024 (type) : Back Bay, Colaba, Bandra. Tuticorin (Hare Island).



After I had examined the Indian plant it was clear that in several respects it resembled the plant which in my West Indian algal flora I had referred to *P. macrocarpa*, though at that time I was unable to compare it with authentic material. In order to do this now, and to try to find out whether or not the branches of the true *P. macrocarpa* are axial, like those of *P. sertularioides* (a species for which *P. macrocarpa* is often mistaken), I wrote to the Kew Herbarium and asked permission to see some authentic specimens of *P. macrocarpa*. The permission was granted, and the Director kindly sent me several specimens, and in a letter Mr. Cotton was so kind as to let me know that, for want of a specimen which could be said with certainty to be the type, two specimens from Portrush near the border of Co. Antrim and close to the type locality (Portstewart) gathered by the same

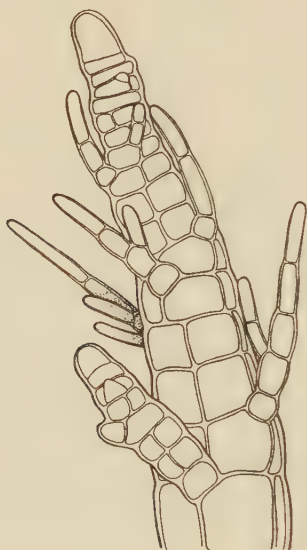


Fig. 15. *Polysiphonia platycarpa* Boergs. Apex of a filament ( $\times 350$ ).

collector, D. Moore, might be regarded certainly as true specimens of *P. macrocarpa*. Having now examined these specimens, I am able to state, from the cystocarpic specimens which had well developed trichoblasts, that the branches appear in the places of the trichoblasts, and therefore, are not axial (Fig. 15). In this respect *P. macrocarpa* agrees with the Indian plant, but otherwise the latter seems to me both as regards the size\* and the shape of the cystocarps to differ so much from the Atlantic plant that I have preferred to describe it as a new species.

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\*As the size of *P. macrocarpa* does not seem to be given, I may here mention that the main filaments near the base were up to about  $80\mu$  thick, and higher up, where the cystocarps occurred, about  $45\mu$ . A cystocarp was  $363\mu$  long and  $308\mu$  broad, and the long neck  $60\mu$  long. The two specimens from Co. Antrim were 2 cm. high.



Fig. 16. *Polysiphonia platycarpa* Boergs.  
Filaments with tetrasporangia ( $\times 55$ ).

To the description given above I wish also to add that the plant forms dense, soft, very much ramified tufts of a dark purple-red colour when dry. The branches and branchlets are directed upwards (Fig. 16), not recurved as in *P. macrocarpa*. The trichoblasts (hairs) are as a rule well developed; they are arranged in a left handed spiral with a  $1/4$  divergency, a trichoblast, or rarely, a branch, being given out as a rule from every segment (Fig. 15). The cystocarps (Fig. 17) are large and of somewhat variable size; for instance the cystocarp shown in Fig 17a is  $250\mu$  long and  $280\mu$  broad; in Fig. 17b  $320\mu$  long and  $340\mu$  broad. The antheridial bodies were found only once in a collection from Tuticorin; they agreed with my figure 32a, p. 83 in "Mar. Alg. from the Canary Islands" (Biologiske Meddelelser 9, 1, 1930), as they had no sterile cell at their summits.

***Polysiphonia elongata*** (Huds.) Harv. in Hooker, Brit. Flora, 333 (1833); J. Agardh, Spec. Alg. 2, 1004.—*Conferva elongata* Huds. Fl. Angl. ed. 2, 2, 599 (1778). *Polysiphonia Ruchingeri* (Ag.) J. Agardh, Alg. Mediterr, 136. For more literature see De Toni, Syll. Alg. 4, 903.

INDIA : Karachi, 1883, J. A. Murray (Herb. Kew).

*Distr.* Atlantic Ocean, Mediterranean Sea, Black Sea.

The Indian specimens belong to J. Agardh's subgroup II. *Ruchingeri*. The virgate arrangement of the branches and branchlets and the fact that the branchlets are elongated, spindle-shaped, tapering towards the base and summit are characteristic of this group. This is clearly seen in the Indian plant. Their appearance agrees very well with Harvey's pl. 293 in "Phycol. Brit," but the Indian specimens are coarser and dark-brown, almost blackish. The specimens adhere strongly to paper with the exception of the big main stems. The cortical layer is very much developed and found from near the tips of the filaments; in the main stems the central and the four pericentral thick-walled cells are surrounded by 3-5 layers of cortical cells which become gradually smaller towards the periphery and are covered by a thick cuticula. In this species the



Fig. 17. *Polysiphonia platycarpa* Boergs. Cystocarps ( $\times 125$ ).

branches occur in the place of trichoblasts and in spite of the maturity of the branchlets (with ripe or nearly ripe tetrasporangia) I have been able to observe this fairly well. Furthermore I have succeeded in observing the secondary large pits found in the thick main stems. In agreement with Rosenvinge's description and figures (Marine Algae of Denmark, part 3, Rhodophyceae III, 415, fig. 357) these pits traverse the transversal walls and the pericentral cells and are about ten in number. The articulations in the upper thin filaments have a length of about  $130-160\mu$ , being as a rule shorter than thick. The cortical cells have generally the same length as the siphons.

The specimens being tetrasporiferous were gathered in June.

***Polysiphonia variegata*** (C. Ag.) Zan., Synops. Alg. 60; J. Agardh, Spec. Alg. 2, 1030; Falkenberg, Rhodomelaceae, 119,



t. 21, fig. 30 ; Boergesen, Mar. Alg. D.W.I. **2**, 269–71, figs. 263–66.  
—*Hutchinsia variegata* Ag. Systema, 153.

INDIA : Karachi, 1882, 3, J. A. Murray (Herb. Kew). Okha Port.

*Distr.* Mediterranean Sea, warmer Atlantic, European and North American coasts, West Indies.

The Indian specimens agree well with Falkenberg's description. The specimens form dense bushes the colour of which is a dark purple-red. The inferior decumbent filaments are fastened to the substratum by means of short rhizoids ; they are about  $450\mu$  thick and have thick walls. The length of the cells is about  $\frac{3}{4}$  of the breadth. In the middle of the thallus the filaments have a breadth of about  $200\mu$  and about twice, in some specimens, up to 4 times, as long. The filaments taper gradually upwards to about  $20\text{--}25\mu$ . The branches in the lower parts emerge at almost right angles, but in the upper part of the filaments the angles are acute, and branches and branchlets therefore erect and nearly parallel. The filaments near the base are rather rigid, whereas the thallus in the upper part is soft and when dried adheres strongly to paper. In the ample material gathered at Okha Port I found that the number of pericentral cells varies greatly. According to Falkenberg the number of

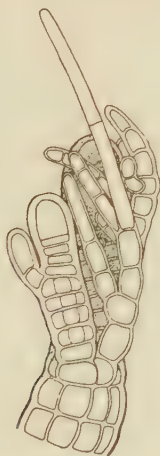


Fig. 18. *Polysiphonia variegata* (C.Ag.) Zan. Apex of filament ( $\times 350$ ).

pericentral cells is 7–6 in the lower filaments, 6–5 in the upper ones. De Toni, Sylloge, says 5–8. In some of my specimens I have found only 7 from base to top, in some 7–8 or 7–9. In one filament I have found even 10. In a few specimens of this species from Karachi belonging to Kew I observed in one specimen 6–7 and in another 6–9. The Indian specimens thus generally have a higher number of pericentral cells than the Atlantic-Mediterranean specimens, and it is the same with the West Indian ones (Boergesen, Mar. Alg. D. W. I. **2**, 270). I have not found any cortical layer in the Indian specimens. As described by Falkenberg the branches

are formed at the base of the trichoblasts, being pushed to the left side of the latter (Fig. 20). Whereas in the Indian plant the number of the pericentral cells, as mentioned above, showed a tendency to be a little greater than that of the Atlantic specimens, the Indian specimens as regards the equally essential character of this genus, viz. the mutual placing of the trichoblasts and the branches, appeared to agree perfectly with the Atlantic plant. The trichoblasts are placed in a spiral, but at intervals there are several bare segments.

I have only found tetrasporic specimens. The tetrasporangia form almost straight rows in the upper ends of the filaments and branchlets. The tetrasporic filaments were gathered in January.

**Lophocladia Lallemandi** (Mont.) Schmitz, Die Gattung Lophothalia J. Ag. in Ber. d. deutsch. bot. Ges. **11**, 223; Falkenberg, Rhodomelaceen, 552.—*Dasya Lallemandi* Mont. in Ann. Sci. Nat. Bot. **12**, 289 (1849).

INDIA : Okha Port, cast ashore.

*Distr.* Mediterranean Sea, Red Sea, Indian Ocean, etc.

In "The Marine Algae of the Danish West Indies" (2, 302) I have described not only the stichidia, but also the antheridial bodies and the cystocarps of *L. trichoclados* at that time not known in the genus. In the Indian material I have found specimens with tetraspores and cystocarps. Although the structures of the vegetative thalli in both species on the whole agree quite well, they differ essentially in one respect, namely, as pointed out by Schmitz and later by Falkenberg, in *L. Lallemandi* branches are formed exogenously at the summit of the thallus in place of trichoblasts, entering into the spiral of these, whereas in *L. trichoclados* the ramification takes place only by means of adventitious, endogenous branches. The formation of the cortex in *L. Lallemandi* is, as with *L. trichoclados*, limited to rhizoids running downwards in the furrow between the pericentral cells; only in the basal part of the thallus the cortex is more or less broadened out over the surface of the pericentral cells. Nevertheless the middle part of these is left free in the material which I have examined. The trichoblasts are like those in *L. trichoclados* alternately ramified with all the branchlets fanlike in one plane and placed transversally against the main stem.

The tetrasporic plants are rather large, 10–11 cm. high; the stichidia were all apparently young and small, much smaller than those in *L. trichoclados*. As in that species they are generally developed from the first side branch of the trichoblast; in some cases the following branch also becomes fertile. As a rule two cells at the base of the stichidium remain undivided, the following segments becoming polysiphonous.

The female plant also agrees well with *Lophocladia trichoclados*, the procarps having the same shape as shown in my fig. 310 (l.c.). The ripe cystocarps (Fig. 19) of which I have seen only a few specimens are shorter and broader with a shorter neck than those of *L. trichoclados*. The one figured here was 400 $\mu$  broad and 370 $\mu$  long

with the neck. The neck alone was  $66\mu$  long. The stipe in the ripe cystocarps is thick and vigorous. The female plant was much smaller than the tetrasporic one; it seemed to be stiffer and the branches were accurately bent. Mme. Dr. Weber (Liste Alg. Siboga 363) has also found the stichidia and cystocarps of this species; but no description of the shape and size of the ripe cystocarp is given.



Fig. 19. *Lophocladia Lallemandi* (Mont.) Schmitz. A cystocarp ( $\times 60$ )

**Heterosiphonia Wurdemanni** (Bailey) Falkb. Rhodemelaceen, 638; Boergesen, Mar. Alg. D.W.I. 2, 324.—*Dasya Wurdemanni* Bailey in Harvey, Nereis Bor.-Am. 2, 64.

Forma *laxa* Boergs, l.c. 326-7, figs. 327-8.

INDIA: Okha Port, east ashore; Tuticorin, Hare Island.

*Distr.* West Indies, Key West, Canary Islands, Cadiz, Mediterranean Sea, Malay Archipelago.

The few specimens which I have found of this species all belong to forma *laxa*. As pointed out by Falkenberg and mentioned, too, by myself this form has always only 4 pericentral cells, compare my fig. 328 c. Every branch-system has 3 polysiphonous segments of which the two basal ones are incorporated in the sympodium of the main stem; all the remaining upper segments are monsiphonous. As in the West Indian plant a good deal of the branches and branchlets end in shorter or longer often hook-formed rhizoids (comp. fig. 328 b). The material was sterile.

**Pterosiphonia cloiophylla** (Ag.) Falkb. Rhodemelaceen, 271.—*Rhodomela cloiophylla* C. Ag. Spec. Alg. 375. *Polysiphonia cloiophylla* J. Ag. Spec. Alg. 2, 934.

INDIA: Karachi, Dec. 1880, Sept. 1881 and March 1882, J. A. Murray (Herb. Kew).

*Distr.* Cape.

In the Kew Herbarium several specimens of this species, hitherto known only from the Cape, are present. It is very closely allied to the European *P. complanata*. Besides the geographical distribution Falkenberg points out that the most essential difference between the



two species is that in *P. complanata* 5-6 segments of the branch grow congenitally together with the mother branch, whereas in *P. cloio-phylla* this growing together as a rule is reduced to two segments; the last mentioned feature is also met with in the Indian plant. J. Agardh distinguishes between several forms of this variable species; these forms which most probably are due to environment or fertile or vegetative conditions of the plant are also present in the specimens belonging to the Kew Herbarium. Specimens collected in March have tetraspores.

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## II—BOTANY OF THE CAMBRIDGE EXPEDITION TO EDGE ISLAND, S.E. SPITSBERGEN, IN 1927. Part I.\*

A. P. G. MICHELMORE.

### ITINERARY.

In the summer of 1927 I accompanied the late Mr. H. G. Watkins' expedition from Cambridge to Edge Island as one of the biologists. Some notes on the vegetation and a collection of vascular plants were made. The information gained is by no means exhaustive, for less than a month was spent in Spitsbergen, most of the weather was inclement, and my main interest was in collecting animals. It is hoped, however, that as this part of Spitsbergen is so little known these notes may have some value.

Watkins (3) gave an account of the expedition before the Royal Geographical Society, and appendixes by other members of the party were printed with the account of his lecture. Watkins dealt mainly with the travels of the inland exploring party and did not describe in detail the itinerary of the shore party, which is therefore given here.

On July 31st, a party of us landed at Keilhau Bay and camped by an old wooden hut near the shore. At this point the high cliffs of Whales Point, the south-western corner of Edge Island, give way to a sloping shore with a series of terraces each bounded by a steep slope twenty or thirty feet high. These slopes looked as though they might have been old cliff lines since left high and dry by the elevation of the land. On one side of the hut is a little bog, and on the other a stream runs over the stony ground. The south aspect and the plentiful supply of running water made the place one of the most botanically favourable of those visited. Nearly all the species found in the open "fjaeldmark" were seen here. The neighbourhood of the hut was like a little alpine garden full of gay flowers.

On August 4th, the boat sailed to the west coast and anchored in a sheltered cove near the southern end of the Plain of the Russian Base. Two interesting days were spent exploring this district. The plain was formed by a large dolerite sill, whose edges supported a rich vegetation. On the surface of the sill was a large expanse of moss bog in which grew a number of special bog plants. Of

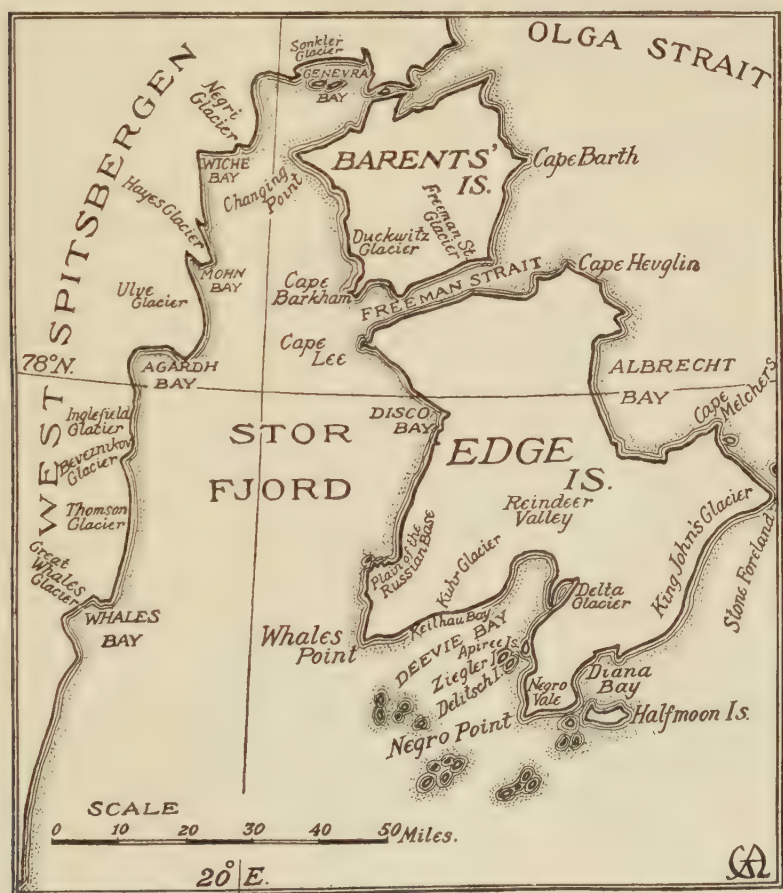
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\*Part II, consisting of an account of the ecology of the area, is published in the *Journal of Ecology*, **22**, 156-76 (1934).

these *Ranunculus lapponicus* L., *R. lapponicus* L. x *R. Pallasii* Schlecht., *Cochlearia arctica* Schlecht. and *Chrysosplenium tetrandrum* (N. Lund) Th. Fries were found nowhere else. Their occurrence here only was probably due to this being the only place visited where such extensive bogs were found and does not necessarily indicate a favourable climate.

August 6th and 7th were spent at Andree Island on the south-east coast of Deevie Bay. This place is also formed by part of a dolerite sill, which is now connected to the mainland by a stretch of damp sandy ground bearing marine shells. The sill is not big enough to bear the amount of bog found at the Plain of the Russian Base, but two fjaeldmark plants, *Koenigia islandica* L. and *Carex ursina* Dew, were found here and nowhere else.

On the evening of August 7th the boat moved out to Ziegler and Delitsch Islands. The next morning a gale drove us back to the head of Deevie Bay, and we were unable to land. On the 9th we



Map illustrating itinerary of the expedition.

N.B.—"Apiree" Is. should read "Andree" Is.

landed a little to the south of an apparently previously unnamed glacier (the "Delta Glacier"), which breaks through the hills and pushes its terminal moraine into the sea. The glacier is easily recognised by the large lagoon contained between the moraine and the tip of the glacier itself. The coastal plain was not examined especially here, but Mr. N. L. Falcon, the geologist of the expedition, and I devoted the day to a climb up to the flat top of the line of hills behind the plain. The vegetation on the slopes and on top was poor, and no unusual species were found.

On the 10th we moved across to the Kuhr Glacier to pick up the sledging party, who had been camping in very uncomfortable conditions on the ice cap. The 11th, 12th and 13th were devoted to exploring the coastal plain and the great terminal moraine of the Kuhr Glacier. The plain was very barren, being largely covered with mud brought down by streams from the glacier. Even the moraine was rather barren, but *Braya purpurascens* (R. Br.) Bunge was found here for the first time.

Having said goodbye to a party of three, who set out to traverse the island, the rest of us went round on August 14th to Cape Lee, the north-western point of Edge Island. Another surveying party was dropped here, but I had only an hour or two ashore during which *Dryas octopetala* L. was found.

Immediately after this we sailed for the coast of West Spitsbergen. At 8.45 p.m. we landed by the hut on the north side of Whales Bay, and two and a half hours were spent on the sandstone platform on which the hut stands. Part of this was dry and barren, and part carried a bog, which was drained by a little stream. The most notable plants found here were *Dryas octopetala* L., *Taraxacum arcticum* Dahlst., *Salix polaris* Wahlenb. x *S. herbacea* L., *Dufontia Fisheri*, R. Br. and *Arctophila fulva* Rupr. At 11.15 p.m. we embarked again and sailed southwards, but rough weather prevented landing. We returned therefore to Whales Bay the next morning. At a height of 1000 feet or so there was a marked terrace in the hills behind the narrow coastal plain. A reddish colour suggested the presence of a belt of vegetation on the terrace and prompted a climb to the top of a hill on the west side of the valley at whose mouth we were. The red colour was found to be due to a bed of red rock, and the whole hill above the lower slopes was very barren. On returning a fresh Crucifer was seen not far inland, but it was not collected, as I was busy looking for mites and insects at the time. Unfortunately it was never found again, and so its identity is uncertain. It was not a *Braya*, *Cardamine*, *Draba* or *Cochlearia*, and the only other Crucifers given by Resvoll-Holmsen in her Flora (2) are *Arabis alpina* L., *Eutrema Edwardsii* R. Br. and *Parrya nudicaulis* (L.) Regel. Of these it is the most likely to have been the second.

Part of August 16th was spent at Agardh Bay, where there is quite a broad coastal plain of stony and very barren ground. On



returning to the boat we found that it had got aground and had only been floated again with some difficulty. We then moved north again and landed in Mohn Bay. The shingle beach here was full of curious pits, which were caused presumably by pieces of ice being stranded and melting on the shore. The effect of drifting ice is seen in the complete barrenness of the shore line everywhere in this part of the world. After some wading through mud the moraine on the southern edge of the Hayes Glacier was reached but was found to be very barren. Next a dolerite sill nearby was explored, and *Dryas octopetala* L. and *Salix polaris* Wahlenb. x *S. herbacea* L. were found.

Changing Point on Barents' Island was visited on the 17th. This place was very like Keilhau Bay, both in the terraced slopes of the ground, and in the abundance of flowers. The chief difference was that the shore consisted of a low cliff instead of a sloping beach.

On the 18th we returned to Cape Lee, where three of us camped in the hut and in tents while the ship sailed elsewhere. The actual point is formed by a dolerite sill, on which a number of the less common plants were found. To the north is a long stretch of sandy shore connecting the sill with the steep hills which here come close to the sea. Here there were enormous numbers of bones of walrus, seal, reindeer and arctic fox, but plants were not very common.

After four days of steadily deteriorating weather we were picked up again by the boat in the early morning of the 22nd, in a blizzard. We sailed eastwards through Freeman Strait to Cape Heuglin, where we picked up Watkins' party. We remained at anchor behind Cape Heuglin for the day to shelter from a gale. On August 23rd we slipped across Freeman Strait and anchored just east of the Freeman Strait Glacier on Barents' Island. Though we landed here, the cold weather discouraged collecting. The vegetation was much the same as that found elsewhere, but *Braya purpurascens* (R. Br.) Bunge was found again on the moraine of the glacier.

On the weather improving a little we sailed right round the west coast of Edge Island and landed on August 25th at the south-east end of the valley ("Negro Vale") which cuts across the Negro Point peninsula.

Here I walked inland into the valley, noting the vegetation gradually decreasing as the coastal plain was left, and then climbed up to the plateau on the north-east side of the valley. The plants here were much like those found on the edge of the plateau near the Delta Glacier, but were more varied. The return journey was made along the coastal plain. On the 26th we left and sailed eastward into the ice, our last view of Edge Island being the magnificent ice cliffs of the great King John's Glacier.

#### THE FLORA.

The only previous account of the vegetation of Edge Island and Barents' Island of any importance seems to be that of Kükenthal (1),

who describes briefly the general aspect of the vegetation and gives lists of the plants found at the places where he landed.

In all, sixty species of vascular plants and four hybrids were found on Edge Island and Barents' Island. Three species and one hybrid were found only in West Spitsbergen. Resvoll-Holmsen in her recent book (2) enumerates one hundred and thirty-three species and one hybrid from the whole of Spitsbergen. As one or two of my specimens have been named as species not mentioned by Resvoll-Holmsen the proportion of the total flora found is not quite as high as it appears to be at first. Most of the species not found are delicate plants confined to the fjords of West Spitsbergen.

A characteristic of the vegetation of Spitsbergen is its uniformity. Most of the plants are so generally distributed in their appropriate habitats, that little is to be gained by giving a complete list of the places where the commoner plants were found. In the list of plants which follows localities are mentioned only for the more local species. The scarcity of suitable habitats is clearly responsible for the local occurrence of many of the rarer plants. This is not so evident in warmer climates, where the occurrence of rare plants often seems very capricious.

For the naming of my collection of plants I am indebted in the first place to Messrs. V. S. Summerhayes and F. Ballard of Kew. The former has also kindly given a great deal of help in other ways. Mr. E. Nelves of Kew has confirmed the naming of the *Carex*, and Dr. Björn Floderus has identified the specimen of hybrid *Salix*. All the other critical plants have been named by Dr. J. Lid of Oslo. Dr. Lid's determinations are indicated by an asterisk in the list against the name of plants named by him. To all these gentlemen I wish to record my gratitude for their help.

The order followed in the list is that of Resvoll-Holmsen's Flora (2). Dr. Lid has most kindly revised the nomenclature.

## ENUMERATION.

### EQUISETACEAE.

*Equisetum arvense* L. Common, occasionally fruiting. Moist to wet places.

\**E. variegatum* Schleich. Common, not seen in fruit. Dry to wet places.

### GRAMINEAE.

*Alopecurus alpinus* Sm. Abundant.

*Phippsia algida* (Soland.) R. Br. Common. Moist to wet places.

*Trisetum spicatum* (L.) Richter. Only found on the dolerite sill at Cape Lee and on the sandstone platform by the hut at Whales Bay. Flowers late.

*Deschampsia alpina* (L.) R. et Sch. A common viviparous tussock grass, lacking the red colour of many of the other species.

It was the tallest species of plant found and was commonly a foot high.

*Dupontia Fisheri* R. Br. Whales Bay, in a moss bog, and on the mossy banks of a little stream.

*Arctophila fulva* (Trin.) Rupr. A single plant was collected from mossy banks of the same stream at Whales Bay.

\**Poa rigens* Hartm. (*P. arctica* R. Br.). Common. As in the other species of *Poa* the heads were very red.

\**P. alpigena* (Fr.) Lindm. x *rigens* Hartm. Probably abundant almost everywhere, but see below under *P. alpigena* x *alpina*. Always viviparous. One specimen with a more spreading panicle than usual from Negro Vale has been labelled "f. *subrigens*" by Dr. Lid.

\**P. alpigena* (Fr.) Lindm. The only specimens collected were some from the turf built up round the walls of the hut at Cape Lee. It is not certain whether this species occurred elsewhere, as it was not differentiated in the field.

\**P. alpigena* (Fr.) Lindm. x *alpina* L. The specimens of viviparous *Poa* collected at Keilhau Bay have all been identified as this hybrid. The viviparous forms of *Poa* were not separated in the field, so it is not possible to say how common this species was, or whether *P. alpina* L., of which no specimens were collected, was seen.

*Puccinellia Vahlia* (Liebm.) Scribn. et Merr. Cape Lee. This species may also have occurred elsewhere, as it was not distinguished in the field from the common *Phippsia algida*, which it resembles in size.

\**P. angustata* R. Br. Specimens were collected at Keilhau Bay, Cape Lee and from near the Freeman Strait Glacier on Barents' Island, but the species was not recognised in the field.

*Festuca arenaria* Osb. Widely distributed but not very common.

\**F. brevifolia* R. Br. Collected at Whales Bay. A grass common on the moraine of the Hayes Glacier and occurring also in the moraine of the Kuhr Glacier was almost certainly this species.

#### CYPERACEAE.

*Carex ursina* Dew. A single tuft at Andree Island.

*Eriophorum Scheuchzeri* Hoppe. Locally abundant in bogs. Plain of the Russian Base, Andree Island and Whales Bay.

#### JUNCACEAE.

*Juncus biglumis* L. Common in bogs. No specimens were collected, so it is just possible that *J. triglumis* L. also occurred.

\**Luzula confusa* Lindeb. Abundant. The considerable variation in size gave rise while collecting to the suspicion that there might be two species, but all the specimens brought back are this species.

#### SALICACEAE.

*Salix polaris* Wahlenb. x *herbacea* L. Abundant at Whales Bay and Mohn Bay, but not seen at Agardh Bay or on Barents' Island or

Edge Island. Only one small specimen from Whales Bay was brought back, and of this Dr. Floderus has written after the name, "the former predominating. The *polaris* indicated by almost entire leaves, the *herbacea* by there being more than four veins on either side of the midrib."

*S. polaris* Wahlenb. Abundant.

#### POLYGONACEAE.

*Koenigia islandica* L. Andree Island, on a rather damp, muddy part of a patch of fjaeldmark on shale between two dolerite outcrops. A minute species, red in colour.

*Oxyria digyna* (L.) Hill. Abundant and always red.

*Polygonum viviparum* L. Abundant, chiefly in dry places.

#### CARYOPHYLLACEAE.

*Sagina intermedia* Fenzl. Common. An early flowering species.

*Minuartia biflora* (L.) Schinz et Thell. Locally common.

*M. verna* (L.) Hiern. Common.

*Stellaria longipes* Goldie. Abundant. A late flowerer.

\**Cerastium hyperboreum* Tolm. Hairy forms of *Cerastium* were collected from three different places, and Dr. Lid has named each set as different, but they were not differentiated in the field. They were amongst the hardiest plants, setting seed in plenty even on the cold hill tops. This species was collected near the Freeman Strait Glacier on Barents' Island.

\**C. alpinum* L. Collected from Negro Vale.

\**C. alpinum* L. x *Regelii* Ostenf. Collected from Keilhau Bay. Dr. Lid has written, "This is what Tolmatchem calls *Cerastium alpinum* L. x *Regelii* Ostenf."

*C. Regelii* Ostenf. This smooth-leaved species flowered much later than the hairy forms enumerated above, only being found in bloom commonly after the middle of August.

*Silene acaulis* L. Common on the dolerite sills on the coast, but not found elsewhere.

\**Melandryum apetalum* (L.) Fenzl. One of the very few fjaeldmark plants which were local. Keilhau Bay, plain below the Kuhr Glacier, Cape Lee, Changing Point, Mohn Bay and Whales Bay. The Whales Bay specimens were taller and less tufted than the others.

#### RANUNCULACEAE.

*Ranunculus lapponicus* L. x *Pallasii* Schlecht. Common in the extensive bogs of the Plain of the Russian Base.

*R. lapponicus* L. A single patch in moss bog at the Plain of the Russian Base, with the hybrid with *R. Pallasii* a foot or two away.

*R. hyperboreus* Rottb. Abundant in bogs.

*R. pygmaeus* Wahlenb. Common in well watered spots other than stagnant bogs.



*R. sulphureus* Soland. An abundant and beautiful species, growing in situations varying from moist places to thoroughly wet moss-bogs on the coastal terraces.

#### PAPAVERACEAE.

*Papaver radicatum* Rottb. Abundant, even in the bleakest situations, setting plenty of seed. The flowers were yellow or white, intermediates being rarer than the extremes.

#### CRUCIFERAE.

*Braya purpurascens* (R. Br.) Bunge. Common on the moraines of the Freeman Strait and Kuhr Glaciers and on the silted maritime plain below the latter.

*Cardamine pratensis* L. Keilhau Bay, Plain of the Russian Base, Andree Island, Whales Bay, Mohn Bay and Changing Point. Frequent in bogs. Flowers late.

*C. bellidifolia* L. Common. Flowers early.

*Draba alpina* group. Yellow-flowered *Draba* plants were common, but I was unable to separate the different forms in the field. Dr. Lid has named my specimens as follows.

\**D. alpina* L. Two specimens from Negro Vale, three from Cape Lee and four from Keilhau Bay.

\**D. oblongata* R. Br. One fruiting specimen from Keilhau Bay.

\**D. glacialis* Adams. One specimen from Negro Vale and two from the moraine of the Freeman Strait Glacier. Dr. Lid writes, "This is the *Draba* of the *alpina* group which in Svalbard was called '*Draba glacialis* Adams,' by E. Ekman interpreted as *D. Bellii* Holm., and by others as *D. Adamsi* Ledeb. It may be identical with *D. macrocarpa* Adams."

\**D. lactea* Adams (*D. Wahlenbergii* Hartm.). Frequent.

\**D. subcapitata* Simm. Common.

\**Cochlearia groenlandica* L. Abundant.

\**C. arctica* Schlecht. One plant in moss bog on the Plain of the Russian Base.

Sp. ? Whales Bay.

#### SAXIFRAGACEAE.

*Saxifraga comosa* (Retz.) Fellm. Frequent on the coastal terraces, where not too dry nor too wet. Keilhau Bay, Plain of the Russian Base, Andree Island, Whales Bay and Changing Point.

\**S. nivalis* L. Common. Brown rust pustules were found on the under sides of leaves of plants at Whales Bay and Changing Point.

\**S. tenuis* (Wahlenb.) H. Sm. Probably commoner than *S. nivalis*, from small specimens of which it was not distinguished in the field.

*S. hieraciifolia* Waldst. et Kit. Keilhau Bay, Plain of the Russian Base, Whales Bay and Cape Lee. Another uncommon fjaeldmark plant like *Melandryum apetalum*.

*S. oppositifolia* L. Abundant.

*S. flagellaris* Willd. Frequent, being found at Keilhau Bay, Plain of the Russian Base, Andree Island, Whales Bay, Changing Point and Cape Lee. Owing to its method of vegetative reproduction by means of slender, radiating runners several plants usually occur together. The rich yellow of the one or two terminal flowers contrasting with the bright red of the rest of the plant makes this little plant one of the most charming of all those found on Edge Island.

*S. Hirculus* L. Common.

*S. cernua* L. Abundant.

*S. rivularis* L. Common in moist and wet places. The occasional absence of the purple streak at the base of the petals in some plants is correlated with the absence of red colour in the stem and leaves.

*S. groenlandica* L. (*S. caespitosa* L.). Abundant. Sets seed in plenty.

*Chrysopenium tetrandrum* (N. Lund) Th. Fries. Beside a big pond with vertical, mossy banks in the moss bog on the Plain of the Russian Base.

#### ROSACEAE.

*Potentilla pulchella* R. Br. Local, mainly on rock outcrops. Plain of the Russian Base, Andree Island, moraine of the Kuhr Glacier and Cape Lee.

*P. emarginata* Pursh. Local, mainly on rock outcrops. Whales Bay, Changing Point and Cape Lee.

*Dryas octopetala* L. Two small patches at Cape Lee ; abundant at Whales Bay and Mohn Bay.

#### SCROPHULARIACEAE.

*Pedicularis hirsuta* L. Abundant.

#### COMPOSITAE.

\**Taraxacum arcticum* Dahlst. On the dolerite sill at Cape Lee and the sandstone platform at Whales Bay. A single fruiting plant of *Taraxacum* was also seen by Mr. A. G. Lowndes on the Kuhr Moraine.

#### FUNGI.

I am indebted to my friend Mr. E. J. H. Corner, Assistant-Director of the Singapore Botanic Garden, for naming a few fungi which I collected. Although toadstools were common in many places, lack of time prevented systematic observations on them. The following list is therefore far from exhaustive and represents only a random collection.

*Scleroderma aurantium* Pers.

*Lycoperdon coelatum* (Bull.) Fr.

*Dictyolus muscigenus* (Bull.) Quél.

*Lepiota granulosa* (Batsch) Fr.

*Cortinarius* sp., cf. *rigidus* (Scop.) Fr. or *brunneus* (Pers.) Fr.  
*Naucoria* sp., possibly *N. hamadryas* Fr.  
*Galera hypnorum* (Schränk) Fr.  
*G. mniophila* (Lasch) Fr.  
*G. sparteae* Fr.?

The fungi usually grew amongst moss, some in drier and some in wetter places. In one spot on the Plain of the Russian Base *Dictyolus muscigenus* was found growing in rings amongst the sodden moss of a bog. Although this species was common, it was not found growing in this way anywhere else.

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2. RESVOLL-HOLMSEN, H. *Svalbards Flora*. J. W. Cappelens Forlag, Oslo (1927).
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### III—MISCELLANEOUS NOTES.

**Mission to Tana River, Kenya Colony.**—Mr. H. C. Sampson, C.I.E., Economic Botanist, Royal Botanic Gardens, Kew, has been seconded for service under the Colonial Office in connexion with a mission to investigate the irrigation possibilities of the Tana River, Kenya Colony. Mr. Sampson left England on January 25th, accompanied by Mr. D. G. Harris, C.I.E., as Engineer, and will be away for about five months.

**The Editorship of the Botanical Magazine.**—The Director, at the request of the President and Council of the Royal Horticultural Society, has accepted the Editorship of the "Botanical Magazine" in succession to the late Dr. Stapf, who had held the position since the Royal Horticultural Society became the owners of the magazine.

**MR. N. Y. SANDWITH.**—The Minister of Agriculture and Fisheries has appointed Mr. N. Y. Sandwith, M.A., to be a Botanist in the Herbarium, Royal Botanic Gardens, Kew, in succession to Mr. S. A. Skan. Mr. Sandwith's service at Kew began in 1924 when he was appointed a Temporary Botanist.

**DR. DARNELL SMITH.**—We regret to record the retirement of Dr. Darnell Smith, Director of the Botanic Gardens, Sydney, New South Wales, on 15th October, 1933.

Dr. Darnell Smith has retired on reaching the age-limit, after having occupied the post of Director since 1924. We understand

that the position of Director is not being filled at present, on grounds of economy, and that Mr. Cheel, as Curator of the Herbarium, and Mr. E. N. Ward, as Curator of the Gardens, are in charge of these two departments of the Sydney Botanic Gardens.

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**Royal Horticultural Society Honours to Kewites.**—Since the last note under the above title appeared in the Bulletin (K.B. 1932, 43), the following awards have been made :—

*Victoria Medal of Honour.*—Mr. D. BLISS, Superintendent of Public Parks, Swansea ; Mr. J. COUTTS, Curator, Royal Botanic Gardens, Kew.

*Associateship of Honour.*—Mr. W. G. BAKER, Curator, Botanic Garden, Oxford ; Mr. J. S. CHRISTIE, Park Superintendent for the Metropolitan Borough of Camberwell ; Mr. W. HALES, A.L.S., Curator, Physic Garden, Chelsea ; Mr. F. R. LONG, Superintendent of Public Parks, Port Elizabeth, South Africa ; Mr. W. R. MUSTOE, Superintendent of the Arboricultural and Horticultural Divisions, Public Works Department, Delhi.

Mr. W. J. BEAN, I.S.O., V.M.H., has been awarded a Silver Medal and £25 for the supplementary volume to his " Trees and Shrubs of the British Isles."

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HERMANN CHRIST.—We have to record with deep regret the death of the famous Swiss botanist, Dr. Hermann Christ, at the advanced age of 99 years. In less than a month he would have attained his hundredth birthday, in honour of which celebrations had already been planned. An unfortunate fall in his room, however, which resulted in a fractured thigh, proved too great a tax on his strength, and, complications ensuing, he passed away during the night of November 16th–17th.

Born on December 12th, 1833, young Christ matriculated in the faculty of Law and after a stay in Berlin, completed his studies at Basel. From then onwards he practised as a lawyer and at the same time started to collect natural history objects of all kinds, botanical studies occupying much of his leisure time. Humboldt's " Ansichten der Natur " first awoke in him an interest in plant life and it is surprising to note that he never, at any time, attended a course of lectures in botany. His only botanical instruction was received on a number of excursions with Alexander Braun.

Christ's published botanical work extends over a period of 79 years and includes more than 300 papers and books. Since all this work was carried out in his spare time, it is evident that Christ was an exceptionally quick worker. The possessor of a very active brain, he had a surprisingly facile pen and it is said that he never re-wrote his manuscript, but sent it to the press exactly as it was first written.

His first work, published in 1854, was a paper entitled " Indication de quelques localités relatives à la flore suisse " and his



last in 1933, "Rosiers du Valais, IV." Plant geography interested him in his early days and a number of minor studies culminated in 1879 in "Das Pflanzenleben der Schweiz" (488 pp.), a work which made him widely known. Schröter is said to have declared more than once that his own school of botanical thought was the direct result of "Das Pflanzenleben." Other works followed in quick succession, including his work on European Coniferae (1863), "Die Rosen der Schweiz" (1873), "Nouveau Catalogue des Carex d'Europe" (1885), "Eine Frühlingsfahrt nach den canarischen Inseln" (1886), and "Über africanische Bestandteile der Schweizer Flora" (1897).

In 1890, at the age of 57, Christ started to work on ferns, and for the next twenty years devoted most of his leisure to the intensive study of this interesting group. His publications on ferns are nearly 150 in number, including the well-known "Die Farnkräuter der Erde" (1897) and the masterly study of fern distribution, "Die Geographie der Farne" (1910). A large proportion of his fern work was taxonomic, and hundreds of new species described by him resulted from the enormous number of collections sent to him from all parts of the world for determination.

He received the honorary degree of Doctor of Philosophy of Basel University in 1885 and in 1909 the degree of Docteur ès Sciences naturelles was conferred on him by the University of Geneva.

At the age of 77 years he commenced a study of the history of botany and in 1916 published "Geschichte des alten Bauerngartens," a much enlarged edition of which was issued in 1923.

Christ's other activities must not be forgotten. As a lawyer he practised as a notary and advocate until his ninetieth year and his law publications are numerous. As a philanthropist also he was well known; he took a keen interest in foreign missions and the repression of slavery, being one of the founders, in 1908, of the Swiss League for the protection of natives in the Congo Free State.

A great man has been lost to science by the death of Christ and by none will his loss be more deeply felt than by the younger scientific workers of his own land to whom he was always a source of encouragement and inspiration.

F. B.

**Transport of Citrus bud-wood in Thermos Flasks.**—At the suggestion of the Colonial Office, the Director of Agriculture, Nigeria, has carried out during last summer an experimental shipment in thermos flasks of Citrus bud-wood from the Department of Agriculture, Trinidad.

The bud-wood was sealed at both ends with wax and wrapped in grease-proof paper. Five flasks were received and the following results reported :—

- Flask No. 1. 100 Marsh Grapefruit Buds. All the bud-wood had turned brown and soft; no viable buds.
- Flask No. 2. 100 Foster Grapefruit Buds. All in excellent condition yielding 92 buds.

- Flask No. 3. 100 Valencia Orange Buds. A few sticks had become mouldy—quite distinct from the brown rot of the Marsh Grapefruit ; 65 buds obtained.
- Flask No. 4. 100 Parson Brown Orange Buds. In the same condition as the Marsh Grapefruit ; no viable buds.
- Flask No. 5. 50 Lue Gin Gong Orange Buds. In excellent condition yielding 50 buds.

“ The two flasks which were completely bad appeared to have become so through bacterial infection, judging by the smell. The success, however, of the other three flasks points to the feasibility of this method, and its low cost is, of course, a great asset.”

“ It is possible that if the bud-wood were properly disinfected prior to being placed in the thermos flasks, the results might have been even more satisfactory than those now reported.”

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**Rancho Santa Ana Botanic Garden.**—This institution was founded in 1927 by Mrs. Susanna Bixby Bryant in memory of her father, John W. Bixby, one of the early Californian pioneers. It is situated in Orange County, east of Los Angeles, and comprises about 200 acres of “rolling hills with deep ravines between,” offering a great variety of soils and situations.

The object of the garden is to bring together a comprehensive collection of Californian plants for purposes of scientific study. There is a herbarium and library, and “field studies are made throughout the State in all seasons.” It is intended to “publish reports from time to time giving scientific, horticultural and popular information in order to serve a much larger group than could ever visit the Garden.” The organization and objects of the Garden are described in a brochure which we have recently received, and which can be obtained on application to Mrs. Bryant, Rancho Santa Ana Botanic Garden, Santa Ana Cañon, Orange County, California.

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**The Type of *Ormocarpum Kirkii*.**—Spencer Moore (Journ. Bot. 1877, 290) based *Ormocarpum Kirkii* on (1) a fragmentary specimen collected by Kirk on the “Somali Coast” (Kenya Colony), and (2) another collected at Mombasa by Hildebrandt (No. 1935). Since the species is named in honour of Kirk, it might be assumed, *prima facie*, that Kirk’s specimen was the nomenclatural type. Comparison of the specimens with the description leads, however, to the conclusion that the actual type—that is the specimen on which the description was principally based—was *Hildebrandt* 1935. Spencer Moore distinguished the species from *O. bibracteatum* (A. Rich.) Bak. by the number and shape of the leaflets, the purely racemose inflorescence and the nearly glabrous calyx. The diagnostic character drawn from the inflorescence was evidently taken from *Hildebrandt* 1935, as in Kirk’s material the flowers are all detached. No single element of the description is taken exclusively from Kirk’s specimen, whereas the whole of the information contained in the following

extracts from Moore's description was drawn from *Hildebrandt* 1935 :—"caule puberulo ; cortice obscurissime aculeato ; petiolo obscurissime aculeato ; racemis paucifloris ; pedicellis gracilibus 1.2-1.7 cm. longis ; bracteis minutis deltoideis ; bracteolis ovatis vix 0.2 cm. longis ; flores lilacini."

The conclusion is irresistible, that *Hildebrandt* 1935 was the type of Moore's description, and therefore of the name *Ormocarpum Kirkii*. *O. Kirkii* was doubtless so named because Kirk's specimen was collected previously to that of *Hildebrandt*. Both sheets are written up by Spencer Moore, neither being specially designated as type.

The case of *Ormocarpum Kirkii* illustrates two important points in nomenclature :—

1. Where a species is based on material from two or more collectors, the fact that the specific epithet embodies the name of one of them does not necessarily indicate the type.

2. Botanists should avoid using a collector's name as a specific epithet unless the type-specimen was gathered by that collector.

T. A. S. & E. M.-R.

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**Penstemon.**—The valid publication of the generic name *Penstemon* was ascribed in the "Index Kewensis" to Mitchell in Act. Phys. Med. Acad. Nat. Cur. 8 (1748) App. 214. As the year 1748 is prior to the now accepted starting-point for recognized botanical nomenclature, the name *Penstemon* has since been cited from Ait. Hort. Kew 3, 511 (1789), under the form *Pentstemon*, and from *Mitchell*, Diss. Princip. Bot. et Zool. 36 (1769), the latter being the reference adopted in Kew Bull. 1928, 359, and in Index Kewensis, Suppl. 7, 180 (1929). *Penstemon* has, however, been attributed by Pennell in Contrib. U.S. Nat. Herb. 20, 325 (1920) to Schmidel, Icones Plantarum, 2 (1762). But reference to Schmidel shows that he was concerned in demonstrating the inadequacy of even the best description for identifying a *species* with certainty, and the superiority of an illustration for this purpose. He gave *as an example* the plant which had been described a short time previously by the English ("ab Anglis") under the name *Penstemon*. He supplied a new description (23 lines long) of this species, mentioning stem, leaves, indumentum, inflorescence, flowers, fruit and seeds, and stated that it would be scarcely possible for anyone to determine by comparison of descriptions, whether or not *Penstemon* was conspecific with *Chelone sine Anonymos flore pallido caeruleo* Gronovius, Flora Virginica, or even to form an accurate mental picture of it. It is, therefore, obvious that his description of *Penstemon* was specific, not generic, and so cannot validate the generic name. It is true that, under the International Rules of Botanical Nomenclature, as revised at Cambridge, the name of a *monotypic* new genus based on a *new* species is validated by the provision of a combined generic and specific description. Schmidel, however, gave no indication (1) whether he accepted the genus



*Penstemon* (unless the printing of the generic name in large capitals can be taken as such); or (2) whether he regarded the species as identical with *Chelone sive Anonymos flore pallido caeruleo*. As these two points are uncertain, it seems clear that the generic name *Penstemon* was not validated by the description supplied by Schmidel.

T. A. S.

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**The Occurrence of *Fraxinus Pallisae* in Western Thrace.**—*Fraxinus Pallisae* Wilmott was originally described (in Journ. Linn. Soc. Bot. **43**, 284: 1916) from the Danube Delta (Dobruja, Roumania). It was afterwards recorded from eastern Bulgaria but has not hitherto, so far as is known, been found far from the Black Sea littoral. Mr. H. G. Tedd, who is making a very intensive botanical survey of western Thrace and thereby greatly enriching the Kew Herbarium with valuable collections of dried specimens, has forwarded to Kew material, collected by him in the Mesta Delta, which undoubtedly belongs to this species. A full account of Mr. Tedd's interesting discovery, together with his extensive field notes, will be published at a later date.

It may be remarked that the name *Fraxinus Pallisae* is used tentatively and without prejudice to any conclusions which may result from investigations, now in progress, concerning the relationships of *F. Pallisae* and *F. oxyphylla* Willd. There is no doubt that the material from western Thrace is taxonomically identical with the type material of *F. Pallisae* from the Dobruja.—W. B. TURRILL.

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**The Distribution of *Ipomoea Pes-caprae* and *Calystegia Soldanella* in South Africa.**—Dr. Guppy stated (Plants, Seeds and Currents, 220) that, as a rule, *Ipomoea Pes-caprae* Roth. monopolises the coasts between the 30th parallels of north and south latitudes, whilst *Calystegia Soldanella* R. Br. holds the shores of the temperate zones beyond. The former extends south to 32° in New South Wales, to 31°30' in the Kermadec Group, and north to 32° in the Bermudas. *Calystegia Soldanella* is known from Europe, Asia (West Asia, China, Japan, the Pescadores, Liukiu Is.), Africa (North Africa, Madeira, Tristan da Cunha), South America (Chile, Uruguay), North America (California), Australasia (N. S. Wales, Lord Howe Islands, Queensland, New Zealand) and the Kermadec Islands. De Candolle stated in 1855 that it did not occur on the east and west African coasts (Géographie Botanique **2**, 1050).

As far as Guppy knew, in 1917 the two species overlapped only in northern New South Wales and southern Queensland, for which Mr. Maiden was quoted as authority; but he added that it has long been known from the observations of Cheesman that they meet in the Kermadecs.

On the Riversdale coast, South Africa, seedlings of *Ipomoea Pes-caprae* from the germination of current-borne stranded seeds appear sparingly during March and April (probably also at other



times) as far as Leven Point and Cape Barracouta, south of the 34th parallel, and on April 13th, 1933, plants were found six to nine inches high which were not there on 15 January preceding (*Muir* 4862).

About eight plants of *Calystegia Soldanella* in perfect seeding fruit were found on December 13th, 1932 at Morris Point, near the Kafirkuils River, among *Sporobolus virginicus*; these had increased by March 29th, 1933, to twenty-three plants, or at least tufts of leaves. Since *Ipomoea carnosa* R. Br. has been confused with *Calystegia Soldanella* (Guppy, op. cit. 217), thus giving a wrong impression of the distribution of the latter, the Riversdale material (*Muir* 4857) was carefully determined by Mr. Hutchinson of the Kew Herbarium.

*Calystegia Soldanella* doubtless exists also to the east of Morris Point, and in any case it and *Ipomoea Pes-caprae* may be said to overlap on the South African coast at Riversdale. Both owe their occurrence there to the dispersal of seed by the sea, although the seed of the former may just possibly have arrived originally in ballast at some point on the coast to the eastwards, completing its migration to its present site by ocean transport. It will be noted that warm currents exist on the south and east African as well as on the east Australian coasts.

The sheets of the South African material of both species have been presented to the Kew herbarium.

J. MUIR, Riversdale, S. Africa.

**The Cultivated Conifers in North America.\***—This excellent work is an elaboration of the section on Conifers which appeared in "The Cultivated Evergreens," by L. H. Bailey, in 1923. It is divided into two parts or "books," the first botanical, the second cultural. The first part is in many respects the more important, for it is a systematic treatment of all the conifers that can be grown in North America. That it is the work of Dr. Alfred Rehder of the Arnold Arboretum is sufficient proof of its thoroughness. An introductory chapter deals with the general characters of conifers, their terminology, nomenclature and other pertinent questions. Pages 19–200 are devoted to descriptions of genera and species arranged under the family headings *Taxaceae* and *Pinaceae*. The botanical descriptions are such as can readily be understood by horticulturists who have not had a thorough training in botany. Keys to genera are given and in the larger genera there are very good keys to species. Following a description of a genus the species are passed in review, each one being described with a reference to the author and original description, with other references when necessary, and the more important synonyms. Where varieties of a species are known they also are described. The alteration in the

\*The Cultivated Conifers in North America, by L. H. Bailey. The Macmillan Company, New York. Pp. ix+404. Illustrated. Price £1 17s. 6d. net.

rule regarding later homonyms at the Cambridge Congress in 1930 has necessitated several name changes that will be disturbing to many readers. For example, *Pseudotsuga taxifolia* has become *P. Douglasii* again, and *Pinus excelsa* is *P. nepalensis*. It is to be hoped that finality will eventually be reached with names that are in constant use among horticulturists.

The second part of the book suggests that it has been made up from a number of articles written by various individuals, dealing with the place of conifers in the landscape, notes on the way in which various kinds thrive under cultivation, propagation, insect pests, fungus diseases, etc. Although written primarily for the people of America the book will be found equally useful in other countries. It is well illustrated and there is a good index. W. D.

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**Hardy Trees and Shrubs.\***—Twenty years have passed since the first two volumes of this important work were published, and in the intervening time Mr. Bean was often urged to prepare a supplementary volume. However, it was not until he retired from the position of Curator of the Royal Botanic Gardens, Kew, in 1929, that he was able to devote the necessary time to the task. In many ways this was an advantage for it enabled him to include many species about which little was known ten years ago, and to form a better opinion as to the merits of some of the newer introductions than would have been possible at an earlier date.

In an admirably written introduction, the author gives short notices of the more recent hardy plant collectors and their work, including Wilson, Farrer, Purdom, Meyer, Forrest, Kingdon Ward, and Rock, and the new volume deals very largely with their introductions. However, by the wishes of his many friends, he has not confined himself to descriptions of trees and shrubs introduced since his first two volumes were prepared, but has included many species which were omitted from his earlier work as not being generally hardy.

The descriptions in the new volume take the same form as those in the earlier ones. After a short generic description, the species are described under the heading of scientific and common name; a reference to a figure is given whenever possible, followed by two paragraphs, the first giving a description of the plant, the second discussing cultivation and other pertinent questions. *Rhododendron* takes up about one-fifth of the pages and even then the author has had to limit himself to descriptions of two hundred of the most distinct species. As the genus *Pyrus* is split up by many modern botanists into several genera, Mr. Bean has compromised by including all under *Pyrus* but giving the alternative name in brackets. This is wise for it seems possible that the division is on the eve of general acceptance. A. B. Jackson has been followed in accepting

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\*Trees and Shrubs Hardy in the British Isles, Vol. III, by W. J. Bean, I.S.O., V.M.H. John Murray, Albemarle Street, London, 1933. Pp. xiv + 517, illustrations 64. Price 36s. net.



the name of *Juniperus Coxii* for the "Coffin Juniper," but whether it is actually distinct enough from *J. recurva* to be given specific rank is open to doubt; varietal discrimination would appear to be sufficient. With reference to *Taiwania cryptomerioides* described on p. 475, it may be of interest to add that M. Y. Orr, in *Plantae Chinenses Forrestianae*, Coniferae (Notes from the Royal Botanic Garden, Edinburgh, 18, no. 88), records that Handel-Mazzetti collected it in the Salwin-Irrawaddy watershed in N.W. Yunnan, and later Forrest found it in Yunnan in side valleys on the Yungchang-Salwin divide, No. 17687, April 1918, and in sheltered side valleys on the Salwin-Kiu Chang divide, No. 20310, September 1921. It has also been found in Upper Burma, and is therefore not wholly Formosan as is often supposed.

The volume is well produced and there are numerous very good illustrations. There can be little doubt that everyone who possesses the earlier volumes will wish to obtain a copy of the new one, for the three volumes must remain the standard work on the subject for very many years.

W. D.

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**Hooker's Icones Plantarum.\***—Part 1 of vol. 3 of the fifth series, which has just appeared, includes plates and descriptions of fifteen new or recently described species, two of them belonging to new genera. The remaining ten plates illustrate little known species or varieties.

*Myrtus communis* var. *tarentina* L. (t. 3203) is a native of Dalmatia and is largely cultivated in Southern Europe; references to it can be traced back to the time of Pliny.

*Amaracus amarus* Bornm. (t. 3204) is a striking Labiate found in Syria; it is allied to *Origanum* and is remarkable for its elongated corolla-tube.

*Gaultheria dumicola* var. *petanoneuron* Airy-Shaw (t. 3206) and *G. codonantha* Airy-Shaw (t. 3207), are natives of Yunnan and Assam respectively and are both described for the first time; for these and two other species a new series, *Dumicolae*, is proposed.

*Queenslandiella hyalina* Ballard (t. 3208) is a widespread annual member of the *Cyperaceae* which, under the name *Mariscopsis hyalinus* Ballard, was the subject of an article in the "Kew Bulletin" for 1932.

*Cleistochloa* C. E. Hubbard (t. 3209) and *Calyptochloa* C. E. Hubbard (t. 3210) are two new genera of grasses from Queensland; both show cleistogamous as well as chasmogamous spikelets.

*Vigna nuda* N. E. Br. (t. 3213) and *Physostigma mesoponticum* Taub. (t. 3214) are herbs frequent in the burnt-grass areas of southern tropical Africa. The flowers in both are strikingly asymmetric.

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\*Hooker's *Icones Plantarum*; or figures, with descriptive characters and remarks, of new and rare plants, selected from the Kew Herbarium. Fifth Series. Edited for the Bentham Trustees by Sir A. W. Hill, K.C.M.G., Sc.D., F.R.S., Honorary Fellow, King's College, Cambridge, Director, Royal Botanic Gardens, Kew. Vol. 3 part 1 (London, Dulau & Co., 1933). Price 10s.

*Crassula Wrightiana* Bullock (t. 3218) is a recently described species from Tropical East Africa ; it is more or less amphibious, and the plate shows some of the variations, which correspond with the depth of water in which it grows.

Other plants figured and described are : t. 3201, *Silene subconica* var. *Grisebachii* David. (Thrace) ; 3202, *Astragalus sericophyllus* Griseb. (North and South Macedonia, Greece) ; 3205, *Cyananthus Wardii* Marquand (S. E. Tibet) ; 3211, *Habenaria longirostris* Summerhayes (N. Nigeria, Uganda) ; 3212, *Habenaria prionocraspedon* Summerhayes (S. Nigeria) ; 3215, *Oxygonum pachybasis* Milne-Redhead, sp. nov. (N. Rhodesia) and 3216, *Oxygonum tenerum* Milne-Redhead, sp. nov. (N. Rhodesia), with dimorphic flowers ; 3217, *Erlangea Quarrei* Hutch. et B. L. Burtt, sp. nov. (Belgian Congo) ; 3219, *Ceropegia filicalyx* Bullock (Tanganyika Territory) ; 3220, *Encephalartos kosiensis* Hutch. (Zululand) ; 3221, *Fockea cylindrica* R. A. Dyer, and 3222, *Fockea gracilis* R. A. Dyer, two very scarce *Asclepiadaceae* from the Albany Division of Cape Province, both with edible tubers ; 3223, *Strychnos tabascana* Sprague et Sandwith (Mexico), 3224, *Strychnos asperula* Sprague et Sandwith (Brazil) and 3225, *Strychnos pedunculata* Benth. (British Guiana, Trinidad), all belonging to the section *Longiflorae*.

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**Botanical Magazine.**—The first part of vol. 157 was published on January 1st and contains the following plant portraits :—*Rhododendron eriogynum* Balf. f. et W. W. Smith (t. 9337), a member of the *Irroratum* series from Yunnan ; *Larix Potanini* Batalin (t. 9338), a widely-distributed Chinese species ; *Anthemis Sancti-Johannis* Stoyanoff, Stefanoff et Turrill (t. 9339), a fine orange-flowered *Anthemis* discovered in the woods near the Rila Monastery, Bulgaria ; *Callicarpa rubella* Lindley (t. 9340), a greenhouse plant allied to *C. Giraladiana* Hesse, with a distribution in China, Indo-China, Burma and Assam ; *Iris histrioides* (G. F. Wilson) S. Arnott (t. 9341), native of Asia Minor and Asiatic Turkey ; *Pelargonium moniliforme* E. Meyer (t. 9341), from the western area of the Karroo and Little Namaqualand, S. Africa ; *Rhododendron tephropeplum* Balf. f. et Farrer (t. 9343), belonging to the *Boothii* series and distributed in S.E. Tibet and northern Burma ; *Geum versipatella* Marquand (t. 9344), a new species allied to *G. sikkimensis* Prain, with white flowers, a native of Nepal ; *Hypericum kouytchense* Léveillé (t. 9345), a species allied to *H. patulum* Thunb., from China ; *Salvia ringens* Sibth. et Sm. var. *romanica* Prodan (t. 9346), from Balčik, Roumania, and *Catasetum maculatum* Kunth (t. 9347), a native of Nicaragua, Costa Rica and Colombia.

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